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ABSTRACT

This document proposes, and indicates initial reaction to, a multi-point satellite-based delivery system which will permit expansion of current programs and services of the Association for Media-based Continuing Education for Engineers, Inc. (AMCEE) consortium to a much larger aggregated audience of practicing engineers throughout the country. It will also permit interaction among universities in state-of-the-art seminars, research reporting, course sharing, and broad distribution of special engineering-related events. The use of a communications satellite is proposed to increase continuing education services to engineering professionals, and to provide a service which is effectively responsive to the technical, logistical, and financial constraints of traditional and other forms of educational instruction. Description of the operational plan includes types of services, delivery, media-based programs, course materials and programs, special needs, operating modes, marketing AMCEE services, satellite considerations, operational programs, and first- and subsequent years considerations. The management plan designates objectives and organization, as well as project control and evaluation, while a complete budget evaluation breaks down contract pricing proposals and other operating costs. Resumes of key individuals and brief summaries for Steering Committee members are included, along with a list of papers, reports, and conference proceedings by AMCEE members. (CWM)

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A NATIONAL SATELLITE-BASED SYSTEM
FOR
PROVIDING CONTINUING EDUCATION TO ENGINEERS

Submitted by:

Georgia Institute of Technology

On Behalf of:

THE ASSOCIATION FOR MEDIA-BASED CONTINUING EDUCATION FOR ENGINEERS, INC., (AMCEE)

Under Contract 400-77-0104

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PART 1: ABSTRACT

Engineers are leading America into the 21st century, developing technology and studying how best to apply it to our needs. During the last decade, a number of major university engineering programs have established media-based systems for providing continuing education to practicing engineers at their work locations. American industry has supported these programs by providing time-off for study during work hours, reimbursement for tuition and fees, and by investing millions of dollars in capital funds for television equipment and facilities.

In response to a need, expressed by both universities and industry, a nonprofit Association for Media-based Continuing Education for Engineers, Inc., (AMCEE) was formed in 1976. The goal of AMCEE is straightforward: TO INCREASE THE NATIONAL EFFECTIVENESS IN THE CONTINUING EDUCATION OF ENGINEERS. Seventeen major engineering colleges and schools are members of the consortium. It is estimated that in-place AMCEE university systems represent a capital investment of ten million dollars, and their industry recipients have another five million dollars invested in receiving, talkback, and playback equipment.

The AMCEE membership has broad geographical distribution, covering major population centers of employed engineers from coast to coast. University members have been serving their off-campus constituencies for five to ten years.

Proposed is a multi-point satellite-based delivery system which will permit expansion of the current programs and services to a much larger aggregated audience of practicing engineers throughout the country. It will also permit interaction among universities in state-of-the-art seminars, research reporting, course sharing and broad distribution of special engineering-related events.

Earth stations will be strategically placed at universities where satellite-delivered programs can be distributed to the hundreds of existing off-campus classrooms through in-place networks. Where appropriate, reception points will also be placed directly on user premises, and at other service head-ends.

During the first four years of operation, AMCEE will test various distribution models to determine the most effective plan for the long-run. AMCEE projects a self-sustaining program beyond the start-up phase.

The entire AMCEE membership, its off-campus participants and the many potential new users of AMCEE services are enthusiastic about the positive impact this new program will have on the engineering profession of the United States.

Part 2: USER NEEDS

A. INTRODUCTION

America's richest resource is its people; and among its people are the engineers who are involved in exploring technology and how best to use it in the future. Technology is changing so rapidly that our engineering population has a very serious problem in communicating new knowledge. The median age of employed engineers is 43; much of our current technology did not exist 20 years ago as they were leaving their formal education to enter their professional careers.

The Goals of Engineering Education report, published in 1968, recognized the need for developing "on-campus study programs for employees of nearby industry and government laboratories," as well as for continued experimentation in "extending high quality advanced-degree education to engineering students employed at locations remote from established campuses."[1]

Rothenberg, in her recent study of continuing professional education in law, medicine, teaching, and engineering, rates the engineering profession as "...most promising as a market for electronic delivery of continuing professional education." She points out that "aside from their primary qualification as educational institutions, universities are 'neutral' organizations within a region, able to gain electronic entrance to, and disseminate information among, many corporations and thus precipitate an information flow which otherwise might not exist among competitors."[2]

B. RECOGNIZING THE NEED AND ADDRESSING THE PROBLEM

Since the late 1960s, a number of major universities have begun media-based programs which link campuses with engineers at their work locations. Table 2-1 lists 27 universities whose engineering colleges and schools provide media-based instruction for engineers employed in industry. Seventeen of those universities are members of the Association for Media-based Continuing Education for Engineers, Inc. (AMCEE). Incorporated in 1976, the organization intends to respond to a recognized need to increase the national effectiveness of continuing education for practicing engineers. That need was the focus of attention at the Dallas "Workshop on Continuing Education for Engineers at Midcareer" which was held in August 1974, under the sponsorship of the National Science Foundation Education Division.[3] Dr. Lionel V. Baldwin, Dean of Engineering at Colorado State University, was the organizer of that first meeting and the series of six follow-up meetings which led to the formation of AMCEE.

Table 2-2 presents the 17 AMCEE universities and their designated representatives. Note that AMCEE members accounted for 88% of the 23,824 television enrollments reported by the universities in Table 2-1 for the academic year 1976-77.

A National Science Foundation report estimates that there are slightly over one million practicing engineers in the United States. Approximately 50% reside in states in which AMCEE is represented by one or more universities.[4] It is impressive to note in Table 2-1 that the 23,824 enrollments were recorded in 1,188 courses which were available to 768 off-campus locations in just one year. Of the courses offered, at least 1,100 of them were shared classroom

6 7

CONTINUING EDUCATION PROGRAMS OFFERED OFF-CAMPUS BY TELEVISION

DURING ACADEMIC YEAR 1976-77

Program (Starting Date)	Delivery Method	Remote Locations	Total Courses	Total Enrollments	Business Courses Also
University of Rhode Island (1961)	Microwave	1	6	19	yes
University of Florida (1964)	Leased Microwave	Program ended in 1972			
Southern Methodist University -TAGER (1967)*	Microwave + ITFS	10	77	669	no
Colorado State University (1967)	Videotape	75	92	2,206	yes
University of Tennessee (1967)	Videotape	18	46	559	yes
University of Illinois/Urbana (1967)*	Blackboard by Wire	18	54	1,251	yes
University of Colorado (1968)	Videotape	33	18	397	yes
Stanford University (1969)	ITFS + Videotape	38	154	2,075	no
ACE at Stanford (1969)	ITFS + Videotape	38	76	2,620	yes
Iowa State University (1969)	Videotape	14	34	289	no
University of South Carolina (1969)	ITV + Videotape	20	48	1,450	yes
M.I.T. (1969)	Produced Videotape	289	31	5,310	no
University of Kentucky (1969)	Film + ITV	17	4	402	NA
University of Michigan (1970)	Leased Microwave + ITFS	10	61	993	yes
University of California at Davis (1970)	Microwave + Cable TV	17	52	140	yes
Purdue University (1970)	Microwave + Videotape	12	21	445	no
University of California/Santa Barbara (1971)	Microwave + Videotape	2	39	68	no
University of Minnesota (1971)	Microwave + ITFS	11	65	711	no
Oklahoma State System (1971)	Microwave + ITFS	NA	NA	NA	NA
Rochester Institute of Technology (1971)	Videotape	4	15	375	no
Case Western Reserve (1972)	ITFS + Videotape	32	39	405	yes
University of Southern California (1972)	ITFS	24	122	2,170	yes
University of Arizona (1972)	Videotape	11	29	272	yes
University of Pennsylvania (1972)	ITFS	Not Currently Operating			
Cornell University (1973)	Videotape	5	10	30	no
University of Wisconsin (1974)	ETV + Videotape	89	20	470	no
University of California/Berkeley (1974)	ITFS	5	10	45	no
University of Idaho (1975)	Videotape	14	14	232	no
Illinois Institute of Technology (1976)	ITFS	7	51	221	yes
Auburn University	In Planning				
Georgia Institute of Technology	In Planning				
University of Maryland	In Planning				
Worcester Polytechnic Institute	In Planning				

* 1975-76 figures
NA - not available

Table 2-1

Table 2-2

ASSOCIATION FOR MEDIA-BASED CONTINUING EDUCATION FOR ENGINEERS, INC.

Membership

1977-78

LIONEL V. BALDWIN (Chairman)
Dean of Engineering
COLORADO STATE UNIVERSITY
Fort Collins, Colorado 80523
303-491-6603

J. DAVID WAUGH (Vice Chairman)
Associate Dean of Engineering
UNIVERSITY OF SOUTH CAROLINA
Columbia, South Carolina 29208
803-777-4177

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Associate Dean of Engineering
GEORGIA INSTITUTE OF TECHNOLOGY
Atlanta, Georgia 30332
404-894-3354

HAL F. SCHULTE, JR. (Treasurer)
Director, Instructional Television
System College of Engineering
UNIVERSITY OF MICHIGAN
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317-493-9201

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Stanford, California 94305
415-497-3613

JOHN T. FITCH (Director)
Director, Technology Based
Educational Development
and Marketing
Center for Advanced Engineering Study
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Cambridge, Massachusetts 02139
617-253-7061

JACK P. HOLMAN (Director)
Chairman, Civil & Mechanical
Engineering Department
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214-692-3066

PETER G. LYKOS (Director)
Professor of Chemistry
ILLINOIS INSTITUTE OF TECHNOLOGY
Chicago, Illinois 60616
312-567-3430

ROSS J. MARTIN (Director)
Associate Dean of Engineering
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Urbana, Illinois 61801
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JACK MUNUSHIAN (Director)
Professor of Electrical Engineering
UNIVERSITY OF SOUTHERN CALIFORNIA
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213-741-2481

JOSEPH E. ROWE (Director)
Provost, Case Institute of Technology
CASE WESTERN RESERVE UNIVERSITY
Cleveland, Ohio 44106
216-368-4434

RICHARD C. DORF
Dean of Extended Learning
UNIVERSITY OF CALIFORNIA -DAVIS
Davis, California 95616
916-752-2857

EDWARD O. JONES, JR.
Assistant Dean of Engineering
AUBURN UNIVERSITY
Auburn, Alabama 36830
205-826-4326

JOSEPH S. MARCUS
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MORRIS E. NICHOLSON, JR.
Director, Continuing Education in
Engineering and Science
11 Mines and Metallurgy
UNIVERSITY OF MINNESOTA
Minneapolis, Minnesota 55455
612-373-3132

DAVID K. BLYTHE
Associate Dean for Continuing
Education and Extension
College of Engineering
UNIVERSITY OF KENTUCKY
Lexington, Kentucky 40506

instruction, transmitted from or recorded in regularly scheduled classes on university campuses. The main exception to this format is M.I.T. which has, until recently, offered only studio produced courses.

Compared to the total estimated population of practicing engineers, the number currently being served by media-based instruction is relatively small. AMCEE's goal is to increase that number substantially over the next four years.

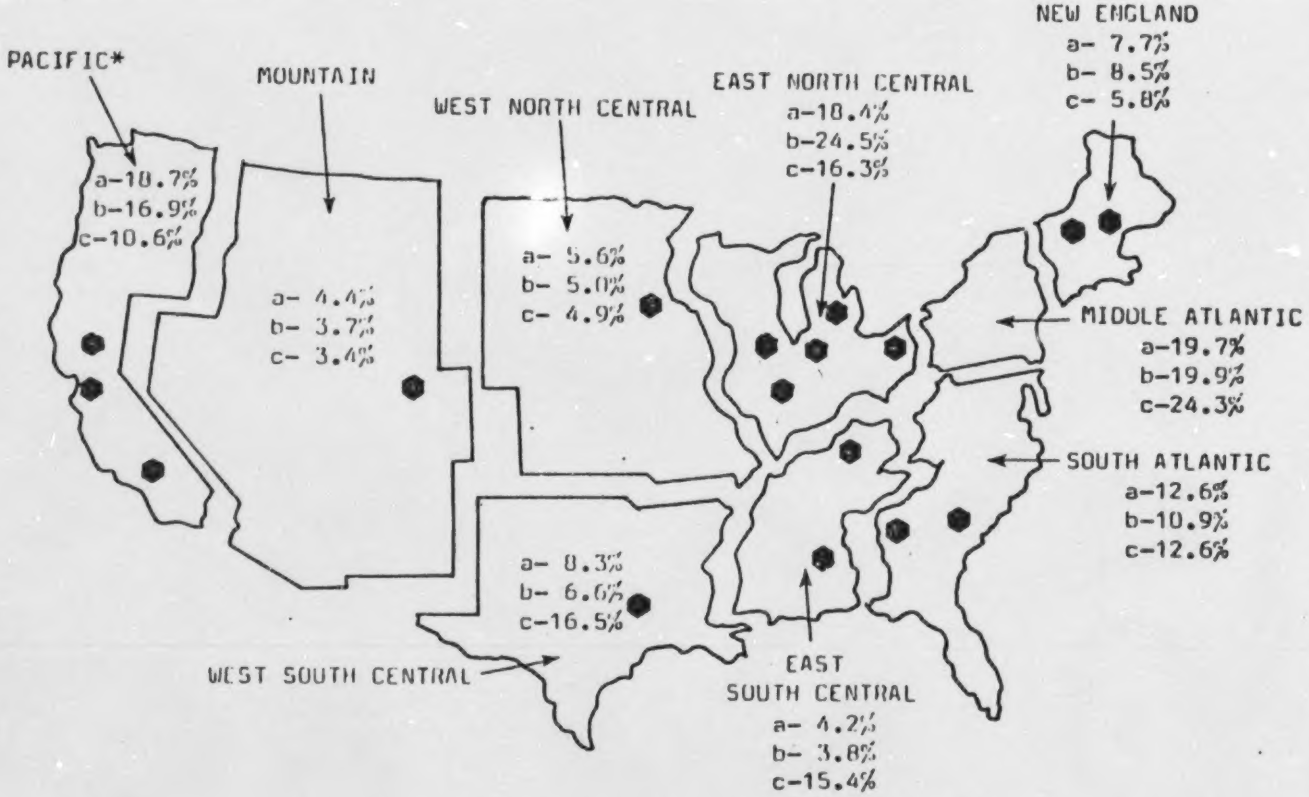
C. AMCEE'S UNIQUE COLLECTIVE CAPABILITIES

As an organization, AMCEE has a unique set of organizational and technological capabilities for bringing about a major increase in the level of participation in continuing engineering education programs on a national scale. Figure 2-1 demonstrates that AMCEE membership is widely dispersed across the United States and that major distribution points are located in population centers of practicing engineers.

The wealth of experience of these universities in working on the problems of delivering continuing engineering education is exceptional. With operating experience of five to ten years behind each of them, the managers of the in-place systems are truly seasoned veterans. They are familiar with problems involved in putting a course schedule together, distributing it, and enrolling students, term after term. Ther know that it costs money to provide high quality media-based instruction, and that their customers must be satisfied with the service or will not return. They depend upon income from users to meet the costs of providing their services. They have experience in dealing with university administrators and faculty, industrial training directors, engineering managers, engineering students of varying ages and abilities,

Figure 2-1

GEOGRAPHICAL LOCATION OF THE ENGINEERING POPULATION, 1972


PACIFIC*
a-18.7%
b-16.9%
c-10.6%
MOUNTAIN
a- 4.4%
b- 3.7%
c- 3.4%
WEST NORTH CENTRAL
a- 5.6%
b- 5.0%
c- 4.9%
EAST NORTH CENTRAL
a-18.4%
b-24.5%
c-16.3%
NEW ENGLAND
a- 7.7%
b- 8.5%
c- 5.8%
MIDDLE ATLANTIC
a-19.7%
b-19.9%
c-24.3%
SOUTH ATLANTIC
a-12.6%
b-10.9%
c-12.6%
a- 8.3%
b- 6.6%
c-16.5%
WEST SOUTH CENTRAL
EAST
SOUTH CENTRAL
a- 4.2%
b- 3.8%
c-15.4%

a-Total Engineers
b-Mechanical Engineers
c-Chemical Engineers

*Includes Alaska & Hawaii.

Source: 1977 Postcensal Survey, National Science Foundation, January 1975

⬢ **Locations of AMCEE members**

equipment manufacturers and vendors, various regulatory agencies, state and federal legislators, etc.

The in-place capital investment in equipment and facilities at AMCEE member universities is estimated at ten million dollars, very little of it funded by federal agencies. In addition the receiving, talkback and playback equipment at the hundreds of companies tied into AMCEE systems probably represents an additional five million dollars. AMCEE universities have convinced their industry members that they should pay for all services rendered, and industry has expressed its willingness to pay as evidenced by the large enrollments already achieved.

D. MEETING THE GOAL

There are several strategies that AMCEE can use in striving to meet its goal of increased participation and effectiveness in continuing education by practicing engineers. One is to provide services to universities and industrial organizations in areas not presently being served. A second is to increase the number of industrial clients in each of the current AMCEE member media-based programs. And a third way is to increase enrollments by providing a broader spectrum of courses and services to present users.

In areas not now being served, AMCEE intends to offer its programs either directly to the users or through local universities. AMCEE can bring continuing education to practicing engineers through this approach. Examples 2-1,2,3,4 support this claim (all examples appear in an appendix to Part 2).

In the case of North Carolina A & T State University, Example 2-1, we find four clearly defined benefits as expressed by Dr. Winser E. Alexander, Chairman of the Department of Electrical Engineering:

1. Provide course materials to significantly strengthen the Master of Science in Electrical Engineering and the Master of Science in Engineering programs.

2. Improve A & T's ability to provide continuing education services to the metropolitan piedmont area of North Carolina which includes the cities of Greensboro, Winston Salem, Highpoint, etc.

3. Enhance A & T's reputation for providing quality programs because of the association with the other universities in the AMCEE satellite project.

4. Shorten the time required for A & T to be able to provide the quality of instruction and courses necessary to establish a Ph.D program in electrical engineering.

Associate Dean David K. Blythe, University of Kentucky, supports the concept of utilizing AMCEE provided services via satellite in the Appalachian Region. In his letter, Example 2-2, he states:

> Because of high technology industries such as mining, power generation, steel manufacturing, coal liquification and gasification demonstration projects, etc., there is a great demand for the most advanced technology. But because of the rugged terrain, absence of engineering colleges in the industrial centers, and sparse population, it is difficult to keep engineering and related scientific personnel "up-to-date" and supply the staff demands.

Support of the concept of AMCEE services being supplied directly to users can be found in Examples 2-3 and 2-4. In the Seattle, Washington area, there is no ongoing media-based service for continuing education available to major corporations such as the Boeing Company. Mr. Philip B. Swain, Director of Educational Relations, Training, and Development, states:

> ...we are, as a major employer of engineers, conscious of the need for better and more cost-effective programs of continuing education.

NASA, Johnson Space Center, has expressed by letter, Example 2-4, its interest in participating in the AMCEE satellite system. The University of Houston is nearby, and a cooperative relationship among NASA, AMCEE and that university is certainly a possibility.

AMCEE members have demonstrated their ability to attract and serve new organizations. This ability will be even greater when they can deliver educational services from a number of major American universities to their own local service areas. User organizations have different educational needs, differing degrees of loyalty to academic institutions and attitudes toward the academic quality of particular universities. Peer relationships among university faculty and high level R & D staff members of industrial/research organizations are significant. The likelihood of a laboratory manager on the west coast knowing several eastern university faculty members is relatively high and vice versa. Taking this into account means, for example, that the capability of a west coast university to provide courses from eastern, midwestern or southern institutions might be a significant factor in attracting and serving new industry members in its area.

In the study of marketing, grouping of competing businesses such as gasoline stations or car dealerships in a given area is said to increase consumer interest. People generally like to have a large variety of a product from which to choose. AMCEE believes that its member's industrial subscribers will achieve a higher level of satisfaction, thus stimulating larger enrollments if they have a broader choice of courses and services from which to choose.

Currently, there are already several examples of intra-AMCEE exchanges of videotaped courses. Examples 2-5,6,7 are taken from program catalogs of M.I.T., Colorado State University, and the University of Southern California. Note that M.I.T. and Colorado State list each others offerings, and that Colorado

State also provides courses by the Association for Continuing Education at Stanford, Texas Instruments, Lawrence Livermore Laboratory, and Purdue University. The University of Southern California has supplemented its own televised graduate level engineering and science courses with videotaped courses from as many as 12 sources including Stanford University, University of Arizona, and Colorado State University, as listed in Example 2-7. Professor Jack Munushian, who heads up that operation, reports very favorable response to those programs. It is anticipated that the AMCEE satellite service will make this type of curriculum sharing more effective in terms of cost and logistics.

E. PROVIDING OTHER SERVICES

In addition to the need to provide improved access to the traditional kinds of continuing education courses for engineers, there is clear need to improve the communication capability among AMCEE member universities, between AMCEE and professional society program participants, and between AMCEE members and other universities that may not have large scale media-based programs but have occasional need for programs to use on campus and in their respective communities.

One of the most often used methods for disseminating information to other faculty members and practicing engineers and scientists is the state-of-the-art technical seminar. For instance, at Stanford University there are 15-20 seminars a week given within the School of Engineering. Of those, five are distributed to industry by television. Countless other seminars are being "delivered" by other AMCEE universities across the country to their local industrial communities. For those that are unique and outstanding, a system for broader national distribution would be invaluable.

Two typical Stanford seminar announcements are presented as Examples 2-8a,b. On several occasions, Professor Oscar Buneman of Stanford's Department of Electrical Engineering has invited his doctoral students to a television classroom at Stanford where they have participated in plasma physics seminars which have been televised from the University of California at Berkeley. And in the reverse, students and faculty at the University of California participated in a unique televised Stanford course on combustion taught by visiting Professor Irv Glassman of Princeton. These are examples that clearly demonstrate that universities make use of each others programs when it is advantageous to do so.

An example of the potential use of satellites for distribution of special technical programs is given in Example 2-9, taken from a bulletin board at Stanford. The student organization, Forum for the Advancement of Students in Science and Technology (FASST), was most enthusiastic about the opportunity to participate at NASA-Ames, California, in a program from the American Association for the Advancement of Science Annual Meeting in Washington, D.C.

The American Association of Aeronautics and Astronautics recently held a televised seminar about a major navigational satellite project. The seminar originated at Oklahoma State University, Stillwater, and was transmitted to 12 receiving locations throughout the state of Oklahoma. A letter of support from that organization is included as example 2-10.

The announcement displayed as Example 11 represents another kind of program which AMCEE hopes to coordinate on a national level. Here one finds cooperation among a professional society (the Institute for Electrical and

Electronics Engineers) a federal agency (NASA) and a university (U.S.C.). A symposium on the space shuttle from Washington, D.C. was broadcast by satellite under sponsorship of the I.E.E.E. and rebroadcast by the University of Southern California to the Los Angeles industrial community.

Example 2-12 outlines a demonstration experiment in sharing curriculum and research results in real time among several universities and industrial participants. North Carolina A & T; Jackson State University, Mississippi; Stanford University, California; Bell Northern Research, Ltd., Ottawa; and Rockwell International Science Center were participants. Two institutions with large minority student enrollments had the opportunity to give and receive reports on high level engineering research projects.

All of the above examples have been selected as samples of the kinds of educational services which AMCEE plans to deliver to meet the needs of students and faculty, at universities, industrial facilities, and professional society gatherings. A need for such services exists. A well conceived satellite-based delivery system will enable AMCEE to provide them.

F. SUMMARY

University engineering colleges and schools have taken a leadership role among the professions in providing continuing education to the practicing professional engineer. Of some 27 media-based programs, 17 are now represented by AMCEE. Geographically, AMCEE member universities are scattered across the United States, with concentrations in states having high engineering populations. Service has been limited to regions that can be covered either by live television or videotape shipped on a tight delivery schedule. Despite the fact that AMCEE television enrollments are running at a rate of nearly 25,000 a year, this figure is but a small fraction of the total potential audience in this country.

A satellite delivery system will enable AMCEE to reach a far greater number of engineers in both industry and the university community as well as provide new information dissemination services not presently possible due to geographical, time and cost constraints.

Letters from prospective participants in the initial placement of earth terminals support the interest of AMCEE universities in this project. Those letters appear as an appendix to this Part 2.

REFERENCES

1. American Society for Engineering Education, Final Report: Goals of Engineering Education, Journal of Engineering Education (January 1968).

2. Rothenberg, D., Continuing Professional Education: Status, Trends and Issues Related to Electronics Delivery, Center for Development, Washington University, St. Louis, Missouri (August 1975).

3. Baldwin, L.V., Collias, A.V., Davis, C.M., Schmaling, G., Workshop on Continuing Education for Engineers at Midcareer, College of Engineering Colorado State University (August 1974).

4. National Science Foundation report: Characteristics of the National Sample of Scientists and Engineers 1974, Part 3, Geographic, NSF 76-330.

Example 2-1

Department of Electrical Engineering
NORTH CAROLINA AGRICULTURAL & TECHNICAL STATE UNIVERSITY

GREENSBORO, NORTH CAROLINA 27411
PHONE (919) 379-7760/7761

February 16, 1978

Mr. Kenneth S. Down
Assistant Dean
Stanford Instructional Television Network
401 Durand Building
Stanford, California 94305

Dear Mr. Down:

The Department of Electrical Engineering at North Carolina A & T State University would be very interested in participating in the Association of Media-based Continuing Education (AMCEE) satellite project. I served as a tutor for two courses in working with the Tutored Videotape Instruction program at Sandia Laboratories in Albuquerque, N.M. and I am enthusiatic about the possibilities of using a national satellite system to implement such a program at A & T.

Based upon my experience and my knowledge of the requirements for continuing education at A & T, the tutored videotape Instruction format could be used to significantly enhance our current graduate program.

The School of Engineering at A & T currently has a Master of Science in Engineering program. The Department of Electrical Engineering, the Department of Architectural Engineering, the Department of Industrial Engineering and the Department of Mechanical Engineering participate in the program. The program is primarily oriented toward its students entering industry upon attaining the degree. However, recent efforts, particularly in the solid state electronics area, have been directed toward preparing students to continue for the Ph.D.

The Department of Electrical Engineering has been given permission by the University of North Carolina System to plan the Master of Science Degree in Electrical Engineering. It is anticipated that the Department will be able to offer this degree by Fall 1979. Long range plans are for the Department to develop a Ph.D program.

Example 2-1

Mr. Kenneth Down
Page 2
February 16, 1978

A & T's participation in the AMCEE Satellite project would provide the following benefits:

1. Provide course materials to significantly strengthen the Master of Science in Electrical Engineering and the Master of Science in Engineering programs.
2. Improve A & T's ability to provide continuing education services to the metropolitian piedmont area of North Carolina which includes the cities of Greensboro, Winston Salem, Highpoint, etc.
3. Enhance A & T's reputation for providing quality programs because of the association with the other Universities in the AMCEE Satellite project.
4. Shorthen the time required for A & T to be able to provide the quality of instruction and courses necessary to establish a Ph.D., program in electrical engineering.

As you have probably noticed, my response is primarily directed toward participation by the Department of Electrical Engineering. This does not mean that the other departments in the School of Engineering are not interested. Preliminary discussions indicate that they are very interested. However, the Department of Electrical Engineering will take the leadership role in interaction with Stanford to establish the program.

It was a pleasure to talk to you and the other participants at Stanford during the CTS demonstration at A & T on February 9, 1978. I look forward to more productive interaction.

Sincerely,

Winser E. Alexander

Winser E. Alexander
Chairman

WEA:mqw
cc: Dr. S. Chandra
Dr. W. Craft

Example 2-2

UNIVERSITY OF KENTUCKY
LEXINGTON, KY. 40506

UNIVERSITY OF KENTUCKY
COLLEGE OF ENGINEERING

OFFICE OF CONTINUING EDUCATION
Telephone (606) 258-5949

March 7, 1978

Dean Kenneth Down
College of Engineering
Stanford University
Stanford, CA 94305

RE: AMCEE Satellite Project

Dear Ken:

Dr. Noffleet Williams, Director of the Resource Coordinating Center, Appalachian Educational Satellite Program at the University of Kentucky, has asked me to comment on the need for Technical Continuing Education Programs in Appalachia. The Office of Continuing Education has been working with Engineers and technical support staff in the Appalachian counties of Kentucky for about eight years.

Because of high technology industries such as mining, power generation, steel manufacturing, coal liquification and gasification demonstration projects, etc. there is a great demand for the most advanced technology. But because of the rugged terrain, abscence of engineering colleges in the Industrial centers, and sparse population it is difficult to keep engineering and related scientific personnel "up-to-date" and supply the staff demands.

It is my opinion that the Appalachian Satellite System with its NASA Satellite, Appalachian Regional Commission support, and 45 ground stations (with staff at these sites) is an ideal system for a formal tie with AMCEE's resources and capabilities. In Kentucky alone, we have a mailing list of several thousand engineers and technicians who might be reached by television generated programs scattered throughout the Appalachian counties who need AMCEE level courses.

Please let me know if you need additional supporting data.

Sincerely,

David K. Blythe,
Associate Dean

DKB/sja

—An Equal Opportunity University—

ENGINEERING CONTINUING EDUCATION

Example 2-3

THE BOEING COMPANY

P. O. Box 3707
Seattle, Washington 98124

March 8, 1978
1-1802-063

Dr. Kenneth S. Down
Assistant Dean
School of Engineering
401 Durand Building
Stanford University
Stanford, California 94305

Dear Dr. Down:

Your 'phone call of February 27, followed by your letter of the same date, served to place before us the possibility that, with a successful outcome of a current application for NIE funding, AMCEE might be interested in a relationship with a company under which programs of continuing education for engineers would be available via satellite for in-plant delivery.

The possibility is one of real interest to The Boeing Company, and we would be pleased to be considered for inclusion in such a system if an NIE grant is obtained. As I am sure you will understand, it is not possible for us to make any commitment without a great deal more in the way of information, including costs, and without an opportunity for thoroughgoing review of the matter. Nevertheless we are, as a major employer of engineers, conscious of the need for better and more cost-effective programs of continuing education. It would be in that context that we would review a later and more specific proposal.

Sincerely,

THE BOEING COMPANY

Philip B. Swain
Director of Educational Relations,
Training, and Development

337

STANFRD STNU A

223853 A 1-18-01-037742 TWX SVC 9108741307
PAAUIJAZ RUCHNVM0186 0822231-UUUU--TWX W 9103731162 STANFRD STNU.
NASA
P 232227Z MAR 78
FM NASA JSC HOUSTON TX
TO 9103731162/DR KENNETH S DOWN ASST DEAN AND PRINCIPAL
INVESTIGATOR STANFORD UNIV
STANFORD CA 94305
BT
UNCLAS AH3
DEAR DR. DOWN:

DR. OWEN GARRIOTT HAS DISCUSSED WITH MEMEBERS OF MY STAFF THE EDUCATIONAL TELEVISION SYSTEM PROPOSED BY THE ASSOCIATION FOR MEDIA BASED CONTINUING EDUCATION FOR ENGINEERS, INC. (AMCEE). ASSUMING THAT COURSE AND SEMINARS APPROPRIATE TO JSC'S MISSION ARE BROADCAST, SUCH A SYSTEM COULD BE USEFUL IN MAINTAINING THE TECHNICAL PROFICIENCY OF OUR ENGINEERING STAFF. WE WOULD BE INTERESTED IN KNOWING MORE ABOUT THE SYSTEM WHEN YOUR COURSE OFFERINGS AND PARTICIPATION CHARGES ARE ESTABLISHED. AT THAT POINT, WE WOULD BE PLEASED TO CONSIDER THE POSSIBILITY OF INSTALLING A CRCEIVING STATION AT JSC.

SINCERELY, JACK R. LISTER PERSONNEL OFFICER
NASA JSC HOUSTON TX
BT

NNNN
STANFRD STNU A

Example 2-5

Quality Control

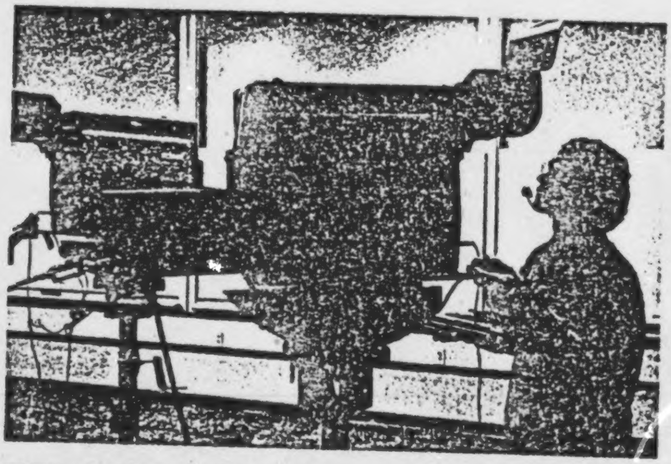
Sanford B. Thayer

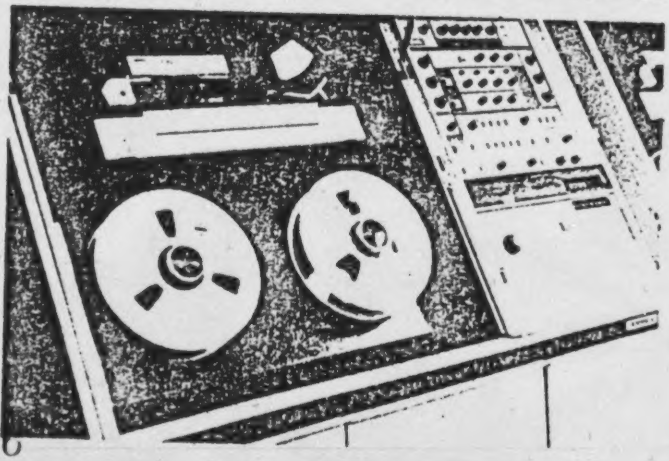
Quality Control presents in ten 30-minute color videotapes the essentials of a modern quality control program for a manufacturing company. Topics include control charts, acceptance sampling plans, specifications and tolerances, and product liability.

The subject can be used either as an initial introduction to the fundamentals or as a review of principal topics for those who have had some practical experience with Q.C. or who wish instruction on the application of a particular quality control plan.

The presentation is designed to serve students who are not strongly inclined toward mathematical analysis. Practical methods, based on the use of standard graphs and tables, are illustrated and explained. Only elementary calculus is assumed.

Sanford B. Thayer is Associate Professor of Mechanical Engineering at Colorado State University. These materials were prepared at CSU and are offered by MIT as part of a cooperative effort in continuing education.





ERG SUPPLEMENT

Example 2-6

The CSU College of Engineering is pleased to announce an expansion of the Engineering Renewal & Growth (ERG) program introduced in July 1975. The additional videotaped self-study subjects which are now available include three produced by Colorado State University, four prepared at the Association for Continuing Education at Stanford University, three developed by Texas Instruments, Inc., and one each from Lawrence Livermore Laboratory, the MIT Sloan School, and Purdue University.

As were our previously announced offerings, these new subjects are intended primarily for mid-career engineers and scientists who, because of the nature of past employment and/or the lack of suitable educational opportunities, have not been able to keep abreast of new developments in their chosen fields.

Skills Refurbishment	provide an additional although less comprehensive option in basic engineering mathematics.
Skills Supplement	present thorough treatments of subjects rarely covered adequately in the engineering curricula of yesteryear - manufacturing quality control, vacuum technology, and a rational approach to diagnostic economics.
Skills Update	continue to emphasize high-technology subjects where progressive obsolescence is most likely to overtake engineers who are not intimately engaged in research and development.
Skills Applied	introduce a new category which pertains to "acquired" management expertise in areas wherein many engineers may be deficient on the job, or in their domestic affairs to an extent which can adversely affect their ability to perform their job.

1

For details on how to obtain course materials for the subjects announced herein or other ERG program offerings, please refer to our 1975 ERG brochure, contact your company Education Officer, or write or phone W.L. "Slim" Somervell:

ERG Field Representative
Office of the Dean
College of Engineering
Colorado State University
Fort Collins, CO 80523
Phone: (303) 491-8417

Example 2-7a

INTERACTIVE INSTRUCTIONAL TELEVISION PROGRAM

UNIVERSITY OF SOUTHERN CALIFORNIA
SSC 510
Los Angeles, California 90007
(213) 741-7663

NOONTIME EMPLOYEE DEVELOPMENT PROGRAM*

Spring 1978
First course starts February 13, 1978

PERSONAL DEVELOPMENT, MANAGEMENT AND TECHNICAL MINICOURSES

May be taken at participating company classrooms or at USC Regional Television Classrooms

El Segundo Regional Classroom
250 N. Nash Street -- between
El Segundo Blvd. and Mariposa
International Center

Woodland Hills Regional Classroom
6451 Independence -- just west of
Desoto off of Victory Blvd.
Warner Center

Personal Development and Management Courses

Speed Reading	TTh	2/21-4/13/78
*Accounting for Secretarial, Clerical and Data Processing Personnel	MW	2/22-4/12/78
Proposal Preparation Using the Modular Technique	MW	2/27-3/22/78
Real Estate Investments	Wed	3/1-4/12/78
Practical French Conversation for Business and Vacation Travelers	TTh	3/7-3/30/78
*Employment Interviewing Skills	MW	3/20-4/5/78
Effective Professional Selling	MW	4/10-5/3/78
**Principles of Estate Planning	TTh	4/25-5/11/78
Memory Power	MW	5/1-6/12/78
*Stress Reduction Workshop	Mon	5/1-5/22/78
Effective Communication for Engineers, and Science Professionals	TTh	5/23-6/15/78
Dynamics of Study Efficiency	TTh	5/30-6/15/78

Technical Courses

Logic Fault Analysis	MW	2/13-3/15/78
Intro. to Computers	TTh	2/16-3/2/78
**The Operational Amplifier--Modelling and Applications	TTh	2/21-3/30/78

(please turn page)

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*This program, comprised of noncredit live and selected videotaped courses from national sources, can be subscribed to separately from the regular television academic program for monthly fees that start at $75/month including necessary receiving equipment.

**These videotapes are available for lease directly through USC.

Example 2-7b

TECHNICAL COURSES

Integrated Circuits Processing Modeling
(Videotaped Seminar Series)

Staff of Stanford Integrated Circuits Laboratory

This series of 7 lectures is a videotape of a workshop held at Stanford on July 8, 1977 to apprise its local industrial community of progress being made in research on integrated circuit process modeling sponsored at Stanford by the Defense Advanced Research Projects Agency.

Introduction - J. D. Meindl
Modeling Ion Implantation: Range Distributions, Annealing & Diffusion - J. F. Gibbons
Transfer Function Modeling of Dopant Incorporation into Epitxially Grown Silicon - K. C. Saraswat
Oxidation Kinetics & Process Effects - B. E. Deal
- J. D. Plummer
Oxidation Kinetics, Theoretical Perspective - W. A. Tiller
The Si-Si02 Interface - W. E. Spicer and C. R. Helms
A Computer Program for IC Process Engineering Models - SUPREM - D. A. Antoniadis and R. W. Dutton

Schedule:	TTh, Apr. 18-May 9, 1978 12:00 Noon-1:00 pm	Supplementary Materials:	Three technical reports (included in fee)
Prerequisite:	Knowledge of the general field	Fee:	$60

Principles of Laser Engineering
(Videotaped Course)

Dr. Roger E. Jones
Professor of Electrical Engineering
University of Arizona

This series of six-lectures is designed to brief field engineers and technicians about laser principles and applications.

Topics include: concept of coherency; lasing and laser component structure; important laser types; laser radiation measures and effects; detection and modulation concepts and techniques; and laser applications including holography.

Schedule:	TTh, May 2-18, 1978 12:00 Noon-1:00 pm	Supplementary Materials:	It is useful to have the General Electric Radiation Slide Rule and the RCA Electro-Optics Handbook (not available from USC)
Prerequisite:	Basic physics	Fee:	No charge(except for students at the Regional Classrooms- $10.00)

Active Filters
(Videotaped Course)

Dr. Aram Budak
Professor of Electrical Engineering, Colorado State University

This 12-lecture course is Part III of a series entitled Network Analysis and Design in the Frequency Domain. It follows part II, The Operational Amplifier, Modeling and Applications, offered earlier in the semester.

Topics in Part III include: control of poles and zeros through feed forward and feedback techniques; large inductance simulation with active networks; low-pass, high-pass and band-pass type feedback; second-order low-pass, high-pass and band-pass functions and their realization; effect of non ideal operational amplifiers on filter performance; filtering; the Butterworth and Chebyshev approximations; low-pass-to-high-pass, low-pass-to-band-pass and band-stop transformations and applications.

Schedule:	MW, May 8-June 19, 1978 12:00 Noon-12:30 pm	Supplementary Materials:	1) Study guide that contains reproductions of chalkboard presentations, reading and problem assignments and solutions for some of the problems. 2) Text, Active and Passive Network Analysis and Synthesis, A. Budak, Houghton Mifflin, 1974, $18.95
Prerequisite:	Knowledge of Laplace transforms & basic circuit theory	Fee:	$50 (includes study guide)

Example 2-8a

STANFORD'S INSTITUTE FOR ENERGY STUDIES and
THE ELECTRIC POWER RESEARCH INSTITUTE announce
TWO PUBLIC LECTURES on

ENERGY

Monday, March 6, 1978

4:15 p.m.

153 Terman Engineering Center

"ISSUES OF CENTRALIZATION AND DECENTRALIZATION IN ENERGY POLICY"

George Pickering
Assoc. Professor of Social Ethics
University of Detroit

Monday, March 13, 1978

4:15 p.m.

153 Terman Engineering Center

"SOCIAL EQUITY PROBLEMS IN ENERGY POLICY"

Denton E. Morrison
Professor of Sociology
Michigan State University

For more information, call Energy Information Center, 497-3237, or Prof. Connolly, 497-4021.

TELEVISED SEMINAR, STANFORD INSTRUCTIONAL TV NETWORK, CHANNEL 3

Example 2-8b

STANFORD UNIVERSITY

Department of Electrical Engineering

EE 200/201 B GRADUATE SEMINAR

Thursday, March 9, 1978 11:00 A.M.

Terman Auditorium

SPEAKER: Dr. Gordon S. Kino, Professor of Electrical Engineering, Stanford University

TOPIC: SIGNAL PROCESSING FOR NON DESTRUCTIVE TESTING

A wide range of acoustic signal processing techniques are being developed to determine, non destructively, the position orientation, size, and type of flaws in metals, ceramics, and composites and the effect of these flaws on the life of a structure. A discussion will be given of new types of electronically scanned and focused acoustic imaging systems employing digital processing. New types of analog and digital filter techniques and divices which may be employed for pattern recognition and for correction of distortions in the medium and in the systems will be described.

TELEVISED SEMINAR

CH 10

WANT TO TALK WITH CARL SAGAN? READ ON...

Example 2-9

STUDENTS TO DISCUSS EXTRATERRESTRIAL LIFE VIA SATELLITE

Students, faculty, and the interested general public, are invited to participate in a special Communications Technology Satellite (CTS) broadcast to the Ames Research Center, Moffett Field, California from Washington, D.C, Tuesday, February 14th, between 12:00 and 3:00 p.m. (local California time).

Titled, "The Search for Extraterrestrial Intelligence: Priority or Pandora's Box?" the program will feature Dr. Carl Sagan, Professor of Astronomy and Space Sciences, Cornell University; Dr. Richard Berendzen, Provost, American University, Washington, D.C.; and Dr. Richard Young, Director, Planetary Biology and Bioscience, NASA Headquarters, Washington, D.C.

This event will be broadcast from the 144th Annual Meeting of the American Association for the Advancement of Science (AAAS) utilizing the NASA/Lewis Research Center's Portable Earth Terminal (PET) and the CTS. Use of the CTS will permit audiences on the west coast to participate via audio/video interface with the Washington, D.C. audience and panel members.

The special seminar will discuss current plans to establish a dedicated search for alien life in the universe. Some concern, however, has been raised by members of the scientific community as to possible consequences of establishing contact with extraterrestrial intelligence. Could they be hostile to planet Earth's inhabitants? Is it possible that earthkind is alone in the universe? Is such a search considered a priority or misapplication of dwindling science funding?

The student organization, Forum for the Advancement of Students in Science and Technology (FASST) is sponsoring the program. FASST is a national organization, dedicated to increasing student understanding and participation in science issues of the day.

OPEN TO ALL - FREE OF CHARGE!

IF YOU ARE INTERESTED IN PARTICIPATING IN THE PROGRAM, CONTACT:

Space Age Review - (415) 325-4755

DATE: TUESDAY, FEBRUARY 14th

PLACE: MAIN AUDITORIUM, AMES RESEARCH CENTER

TIME: 12:00

Example 2-10a

February 1, 1978

AMERICAN
INSTITUTE OF
AERONAUTICS A
ASTRONAUTICS

WESTERN OFFIC
SUITE 800
9841 AIRPORT BLV
LOS ANGELES, CA. 9
213/670-6642

Dr. Daniel B. DeBra
Department of Aero and Astro Engineering
Stanford University
Stanford, CA. 94305

Dear Dan:

As I mentioned the other day on the phone, you might be interested in a couple of the items I've attached as background for your paper "On the Stanford Instructional Television Network" to be given at the February 9 aerospace education session at the AIAA annual meeting.

On January 12 the AIAA Oklahoma section held a highly successful Talkback-TV symposium on NAVSTAR, originating at Oklahoma State U. in Stillwater and beamed throughout the state. I'm enclosing the letter from Steve Pauliny, section chairman, to Jim McLane, Region IV Director, describing the event and citing the principals involved. I'm also sending a descriptive brochure on the Oklahoma Talkback Television system.

I'm extremely excited about the success of the Oklahoma experience and hope its the first of many around the country. I wonder if you're going to address the question of how AIAA sections might utilize public and private university TV networks to deliver technical meetings to members in remote areas? This seems a splendid alternative to the traditional sit-down dinner-cum-rubber-chicken that we've seen for years.

By some coincidence, after I talked with you I caught the tail end of the ASEE College/Industry Education Conference in San Diego, bought the proceedings, and discovered a paper by James Rogers on "Case Western Reserve University's Instructional Television Network (ITN)". It's enclosed.

I'd like very much to sit in on your session Thursday, but typically I can't because that morning I'm committed to the Career Environment Committee.

I'd appreciate knowing if the question of professional societies and instructional television comes up for discussion at your session.

Yours very truly,

Dan

DONALD M. STONE
Director
Section Activities

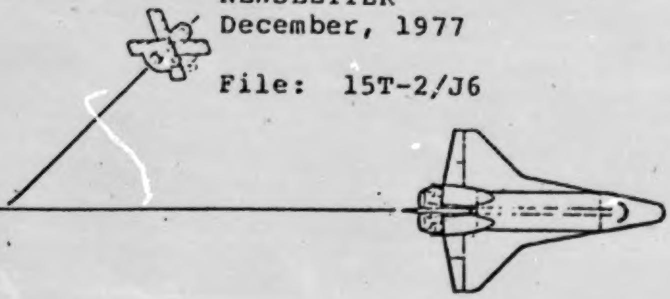
DMS:jw
Enc.
cc: R. Orth

AIAA OKLAHOMA SECTION
AMERICAN INSTITUTE of AERONAUTICS and ASTRONAUTICS

Example 2-10b

NEWSLETTER
December, 1977

File: 15T-2/J6



FLASH!

FIRST AIAA TALKBACK TV SEMINAR

How would you like to be a part of a "first"? You will have that opportunity on January 12, 1978, by participating in the first AIAA Talkback Television Seminar. This should be appealing to you in three ways, other than making history. First of all, the program that Bill Crowley has set up for you, is very interesting and informative. Next, you don't have to drive 60-100 miles to attend, and last, but not least, there is no charge.

Attached to this Newsletter is a list of Talkback Television receiving stations and names of their respective coordinators. You will have the opportunity to go to any of the stations that plan on participating. A call to the coordinator will confirm their participation. (Some companies, due to security reasons, will not have their facilities open to the public). At these stations, you can view the presentations and listen to them in a comfortable classroom setting. If you want to ask a question, you simply pick up a telephone near you and "talk back" to the originating station. This means of communication allows everyone a chance to participate.

At 7:30 p.m., January 12, 1978, you can hear about NAVSTAR (a global positioning system), which is a Department of Defense joint-service project. The fully operational system will have 24 satellites in 3 orbital planes with 8 satellites in each ring. This system has potential applications for commercial users, but its initial use will be military and governmental space, air, land and sea craft navigation.

The system will include receiver equipment and data processors to translate signals from satellites into accurate longitude, latitude, altitude and velocity readouts. Positions that would be known within tens of feet. Several classes of receivers are being considered - from a complex set of high dynamic users (e.g., Fighter Aircraft) to a backpack hand-held unit.

With just a little imagination, a person can enumerate many applications for this system. Why don't you come and learn more about the characteristics and applications of NAVSTAR via Talkback Television!

Marvin Smith
AIAA Talkback TV
Seminar Chairman

UNIVERSITY OF SOUTHERN CALIFORNIA

INTERACTIVE INSTRUCTIONAL TELEVISION PROGRAM

Example 2-11

SPACE SHUTTLE USERS SYMPOSIUM from WASHINGTON, D.C. Feb. 23

TO BE TELEVISED BY THE

USC INSTRUCTIONAL TELEVISION SYSTEM via CTS/ATS SATELLITE

On Thursday, February 23rd 1978, a first of its kind nationwide teleconference will take place via the U.S./Canadian CTS Satellite and the ATS Satellite. Sponsored by the IEEE Aerospace Electronics System Society, the Symposium will be conducted from NASA/Goddard Space Flight Center and will be teleconferenced to NASA Headquarters via connecting microwave link and by satellite to other sites in major U.S. and Canadian cities and universities.

In Los Angeles, The Symposium will be received by the USC Interactive Instructional Television Network and rebroadcast to the Los Angeles industrial community. Interested persons may participate at companies in the USC network, at regional television classrooms in El Segundo, Woodland Hills, Marina del Rey and Long Beach, or on the USC campus.

Prominent scientific space experts will provide interested parties with a broad review of options for using the Space Shuttle. They will address methods and procedures for getting aboard--user policies, operational planning, pricing, mission scheduling, and contracting agreements. An overview of scientific research and applications activities which the STS can accommodate will be presented from various viewpoints including NASA, commercial/industrial, educational, military, and international.

Interactive discussions between the speakers and remote site participants is an important characteristic of the program scheduling.

The conference will start at 8:00 am, Pacific Standard Time and will last until approximately 2:00 pm. It will be broadcast over USC's Instructional Television System CHANNEL 12.

FOR FURTHER INFORMATION, PHONE 741-7663

PLEASE POST

Other Coordinators, Resource & Technical Personnel

NC A&T State University
- Phillip Jeter-Director, A&T University T.V. Studio
- Eloise Sanders-Secretary, CTS Project
- Marvin Watkins-Research Administration,
- Guy Loftin-University Television Studio
- Dr. Isaac Barnett-Safety & Driver Education
- Prof. A.E. Streat-Architectural Engineering
- Zebedee Hicks-Architectural Engineering

Stanford University
- Kenneth Down

Jackson State University
- Dr. Estus Smith-Vice Pres. For Academic Affairs
- Dr. D. Holloway-Asst. Vice Pres. for Acad. Affairs
- Dr. Robert Smith-Dean, School of Arts & Sciences

Southern Educational Communications Association (SECA)
- Dr. Robert Glazier-President
- F. Lee Morris-Principal Investigator
- A.C. Allen-Director, Southern Carolina Education

Mississippi Authority for Educational Television
- Dave Wilson-Engineer
- Bill Haller-Engineer

Communications Research Center
- George Davies-Director
- Ron O'Connor

National Aeronautics & Space Administration (NASA)
- Patrick Donoughe, Lewis Research Center-CTS Manager
- Jack VanNess-Langley Research Center
- Benjamin Smith-Langley Research Center
- A. G. Price-Langley Research Center
- Guy Gurski-Lewis Research Center
- Ervin Edelman-Cleveland Research Center
- Bradford Gibbs-Ames Research Center
- Garth Hull-Ames Research Center
- Varice Henry-Goddard Space Flight Center

Portable Earth Terminal Engineers (PET)

Ken Asbury	Lou Baselice
Joe Fiala	Clarence Neumann

APPLICATIONS OF SATELLITES
in
EDUCATION AND CURRICULUM SHARING,
INDUSTRIAL AND UNIVERSITY RESEARCH

Sponsored by

NORTH CAROLINA
AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

and

NATIONAL AERONAUTICAL AND SPACE ADMINISTRATION

February 7, 9, 1978

Crosby Hall
A&T University Television Studio
N.C. A&T State University
Greensboro, NC

A satellite demonstration experiment in curricula sharing and scientific research results between North Carolina A&T State University, Jackson State University, Bell-Northern Ltd, Stanford University including representatives from Rockwel International Science Center is to be presented. NASA's Communications Technology Satellite will be used in this telecommunications experiment in conjunction with ground stations located at NASA Ames Research Center in Mountain View, California, Communications Research Center in Ottawa, Canada, The Mississippi Authority for Educational Television, (SECA) at Jackson, Mississippi and NASA's Portable Earth Terminal at Greensboro, North Carolina

Example 2-12a

Example 2-12b

Tuesday, February 7, 1978 8:30 a.m.-12:15 p.m. EST

8:30 - 9:30 Audio-video transmission from NCA&T State University, Greensboro, NC to Jackson State University, Jackson, Miss. (SECA) Talk-back from Jackson State to A&T

Introductions - Leo Williams, Jr., Professor of Electrical Engineering A&T; Dr. L.C. Dowdy, Chancellor A&T; Dr. J. E. Duberg, NASA; Dr. John Peoples, President, Jackson State

MASS COMMUNICATION CURRICULUM DEVELOPMENT

At A&T - Richard Moore, Program Director; Omega Wilson, Coordinator; Michael Hailey, Reporter, Burlington NC Times; Isabelle Johnson, Student

At Jackson State - Dr. Johnny E. Tolliver, Head of Dept. of Mass Communications

9:30 - 11:00 Two-way audio-video transmission between NCA&TSU and Bell-Northern Research Ltd., Ottawa, Candda

METALLIC OXIDE AND MICROELECTRONICS RESEARCH

At A&T - Leo Williams, Jr., Raymond Koske, Diane Allison, Myrón Powell, Cheryl Watson

At BNR - Drs. H.M. Naguib, A.H. SpringThorpe, J.C. Dyment, William Westwood

11:00 - 12:15 Two-way audio-video transmission between NCA&TSU and Stanford University

Minority graduate students at Stanford University in Science and Engineering - Tom Harrison, PhD candidate; Walter Lowe, Solid State Physics; Robert Copeland, Electrical Engineering

Discussion between students at A&T and Stanford

Lecture: ADVANCES IN GaAs SOLAR CELLS
Dr. Jim Harris, Rockwell International Science Center Thousand Oaks, California

Discussion - question and answer

Thursday, February 9, 1978 8:30-11:30 a.m. ES

8:30 - 9:30 Audio-video transmission from NCATSU to Jackson State (SECA) Talk-bac from Jackson State to A&T

ONGOING PROGRAMS AND RESEARCH IN CHEMISTRY

Introduction - Joseph A. Bennett, Director, Career Education A&T

At A&T - Dr. William DeLauder, Chairman, Chemistry Department

At Jackson State - Dr. James Perkins, Chairman Chemistry Department

ADVANCED INSTITUTIONAL DEVELOPMENT PROGRAMS AT MINORITY INSTITUTIONS

At A&T - Dr. Willie T. Ellis, AIDP Coordinator

At Jackson State - Dr. Oscar Rogers, AIDP Coordinator

9:30 - 10:20 Two-way audio-video transmission between NCA&TSU and Bell-Northern Research Ltd.

Feedback and evaluation of transmission on February 7th - Prof. Leo Williams, Jr. & Dr. H.M. Nagu

10:20 - 11:30 Two-way audio-video transmission between NCA&TSU and Stanford

SOLID STATE TECHNOLOGY AT NCA&TSU & DATA ACQUISITIO

At A&T - Dr. Winser Alexander, Chairman, Electrical Engineering Dept., Dr. E.K. Stefanaki, Dr. Ali Abul Fadl, Ward Collis, Tom ker, William Nance

INTEGRATED CIRCUITS LABORATORY

At Stanford - Tom Apone, Tom Harrison

Questions, answers, discussion between program participants at NCA&TSU, Stanford and Bell-Northern

College of Engineering
Office of the Dean
303/491-6603

Colorado State University
Fort Collins, Colorado
80523

February 1, 1978

FEB 6 REC'D

Kenneth S. Down
Assistant Dean
School of Engineering
Stanford Instructional Television
  Network
401 Durand Building
Stanford, California 94305

Dear Ken:

This letter is in response to your request that all colleges interested in participating in the initial AMCEE satellite experiments indicate this desire to you in writing. Colorado State University would be pleased to participate in the initial test either as a distributor or in the mixed-distributor and open-market test.

Sincerely,

Lionel V. Baldwin
Dean

ILLINOIS INSTITUTE OF TECHNOLOGY

IIT/V
Interactive Instructional Tele/Vision Network

January 26, 1978

Dean Ken Down
College of Engineering
Stanford University
Stanford, CA

Dear Ken,

The purpose of this letter is to express in a formal way IIT's interest in being part of the AMCEE NIE Proposal for an examination of the viability of use of a communication satellite to deliver higher education and to list reasons why IIT's participation would be appropriate.

As we have discussed, IIT already has engaged in discussion with a vendor and given serious consideration to such an activity, particularly through sharing a transponder with an entertainment-based commercial venture for which prime time is evenings and week-ends, in order to offset the huge costs of satellite communication.

In addition IIT has engaged in serious discussion with two communities bordering Chicago, which have cable TV systems, with a view toward delivering IIT courses via the cable TV system to all interested and qualified sectors of each community Clearly such an activity bears directly on providing educational opportunities to non-university served communities via satellite.

Also IIT has embarked on a cooperative venture with one of 19 liberal arts colleges within reach of IIT's IIT/V broadcast signal with the intention of discovering how access to IIT courses, seminars and other activities can enhance the educational services a liberal arts college can offer to its regular full-time students as well as to part-time students in the community.

Argonne National Laboratory has just become an IIT/V participant. Once the normal IIT/V participation will have been established there, planning and analysis will begin for ANL to become a source of programming to be delivered via the IIT/V network. ANL has 1500 Ph.D's doing multi-disciplinary research in science, engineering and applied mathematics. In addition ANL has numerous scientific visitors from all over the world, many of whom share their knowledge via seminars and conferences. It is hoped that the tremendous intellectual resources of ANL will come to be shared via IIT/V.

IIT Center Chicago, Illinois 60616 (312) 567-3460

I should note that IIT has already begun to work with physically handicapped persons and the State of Illinois Division of Vocational Rehabilitation in order to explore how use of video can help relieve the problem of access by the physically handicapped to educational opportunities.

Finally I should note that IIT has established a good working relationship with Channel 11 (VHF), Chicago's Public Broadcasting System, through its Director of Special Projects, Dr. Singer, and could reasonably expect that that degree of freedom could play a role in the proposed examination as well.

I would be happy, of course, to discuss IIT's interest further with the AMCEE committee charged with developing the NIE proposal.

Yours truly,

Peter

Peter Lykos
Director

PL/pw
CC: AMCEE Board of Directors
Dean Higgins, IIT
Director Dygdon, IIT

Massachusetts Institute of Technology
Center for Advanced Engineering Study
Cambridge, Massachusetts, 02139

FEB 6 RECD

January 31, 1978

Room 9-234

Kenneth S. Down
Assistant Dean of Engineering
Stanford Instructional TV Network
401 Durand Building
Stanford, CA 94305

Dear Ken:

This letter is to indicate our interest in being considered for one of the up/down links in the early stages of the satellite delivery system now being proposed.

An up link would make possible an interesting study of the trade-offs between a possible reduction in our inventory and a concomitant reduction in our revenue due to sales through AMCEE.

A down link would have, we believe, a profound impact on our fledgling TVI program, making possible a much broader spectrum of course offerings. It would also cause us to re-evaluate the video- versus ITFS delivery system question for our local program.

Sincerely,

John T. Fitch

John T. Fitch, Director
Technology Based Educational
Development and Marketing

JTF/rm
c: Dr. Myron Tribus

P.S. Just met Jim Triesmer of IBM (with whom you spoke at San Diego). He seemed very excited at the prospect of CEESAT!

J.

College of Engineering
The University of Michigan

Office of the Dean

March 6, 1978

Dean Kenneth S. Down
School of Engineering
Stanford University
Stanford, California 94305

Dear Ken,

This is to confirm our earlier conversation during which I stated that The University of Michigan desires to be considered as a ground station site for the AMCEE-NIE satellite network for continuing engineering education.

The University has already been designated as an NPR satellite ground station site and our College of Engineering Z Channel ITFS Instructional Television System is located only 1/4 mile away from the NPR satellite antenna site on the campus.

Our system serves the greater Detroit Metro area which is one of the major production areas in the country and we feel that the many engineers and managers who are served by our system will benefit strongly by having Michigan participate actively in the proposed satellite delivery system.

Very truly yours,

Hal F. Schulte

Hal F. Schulte, Director
Instructional Television System

HFS/bf

Ann Arbor, Michigan 48109 · Telephone (313) 764-8470

OUR NEW ADDRESS IS:
320 Aeronautical Engineering
110 Union Street S.E.
Minneapolis, Minnesota 55455

UNIVERSITY OF MINNESOTA

Continuing Education in Engineering and Science
11 Mines and Metallurgy
221 Church Street S.E.
Minneapolis, Minnesota 55455
(612) 373-3132

March 9, 1978

Mr. Kenneth S. Down
Assistant Dean
Stanford Instructional Television Network
401 Durand Building
Stanford, California 94305

Dear Ken:

In response to your letter of February 6, 1978 I want to forward this to indicate our extreme interest in the satellite program for the cost effective delivery of continuing education services to engineers in industry.

Since 1971 the University of Minnesota has had a UNiversity Industry Television for Education (UNITE) instructional television network to provide programs for practicing engineers and scientists. This program currently involves ten companies in the Twin Cities area and the I.B.M. Company in Rochester. We program approximately twenty regular Institute of Technology courses per quarter. The program has been very successful. A number of students who have been interested in persuing master's programs have completed their programs essentially entirely by televised instruction. We have been averaging approximately 200 students per quarter taking courses via television.

Although our program has been successful we have been asked repeatedly by UNITE companies to provide additional programs that are not our courses. The principal kind of program that has been requested is engineering management. At the present time the Institute of Technology does not have and Engineering Management Department and therefore we are unable to reply to this request. It would be extremely worthwhile to the Twin Cities engineers if programs in engineering management as well as specialized topics such as design of supersonic missiles and design of microwave landing systems could be programmed for the satellite.

In our judgment, the satellite would make it possible to provide highly specialized programs that no individual geographic area could provide on a cost effective basis. We also believe that by satellite we could receive programs where nationally known faculty are instructors. At the moment it would appear we should limit our plans to a "receive-only" facility.

I have discussed this with a number of training directors of UNITE companies and found very enthusiastic support for satellite programs. These training directors believe the satellite would provide a significant augmentation to our current program. It would be extremely valuable to their engineers and scientists.

I hope this is sufficient information to indicate our enthusiasm for the program and our hope we will be favorably considered for a "receive-only" facility.

Sincerely yours,

Morris E Nicholson

Morris E. Nicholson
Director

MEN/lls

cc: Dean Walter Johnson

UNIVERSITY OF SOUTH CAROLINA
COLUMBIA, S. C. 29208

COLLEGE OF ENGINEERING
Office of the Dean

March 3, 1978

Kenneth S. Down
Assistant Dean of Engineering
Stanford Instructional TV
  Network
401 Durand Building
Stanford, CA 94305

Dear Ken:

This will confirm our several discussions concerning the involvement of the University of South Carolina in the proposal for a satellite based educational delivery system.

I have discussed the matter at some length with our faculty and with the president of the University and they join me in expressing our enthusiastic and total support of your proposal.

We will be most pleased to be one of the initial earth stations in both the send and receive mode. As you know we have some established experience at both on-campus and in the State ETV system. We are pleased to offer any of that experience which you may feel useful in your efforts.

Please feel free to call on us for any support we can offer to what we feel is a truly exciting and significant proposal.

Sincerely,

J. D. Waugh
Associate Dean

JDW/ss

UNIVERSITY OF SOUTHERN CALIFORNIA

UNIVERSITY PARK • LOS ANGELES, CALIFORNIA 90007

INTERACTIVE INSTRUCTIONAL
TELEVISION PROGRAM
SCHOOL OF ENGINEERING, OLIN HALL
(213) 741-7663, 741-2263

February 10, 1978

Kenneth S. Down
Assistant Dean of Engineering
Stanford Instructional TV Network
401 Durand Building
Stanford, CA 94305

Dear Ken,

I am writing to express the University of Southern California's interest in having both an up and a down link in the satellite project that AMCEE is proposing to the National Institute of Education.

I believe that USC, by virtue of its well equipped four-channel live instructional television system, the innovative uses it has been making of them and its location in one of the great concentrations of high technology industry in the nation, is an ideal site for one of the planned terminals.

I would like to present the following specific additional reasons for this position.

1. USC has had two NSF grants to help develop its program and much of what we are doing is similar to the proposed AMCEE project. In fact, I enclose a paragraph from our proposal to NSF in June 1976 that shows the parallel.
2. We have two regional classrooms in industrial parks as you know. These facilities make it possible for employees of many companies (many very small) to participate in the television program even if their companies don't.
3. Hughes Aircraft Company is moving to a new facility near our El Segundo regional classroom and plans to make USC inplant television classrooms a "showplace" since Hughes expects to become heavily involved itself in satellite delivery of service. Having Hughes involved and interested will be a very positive asset.

4. We will be having some satellite experience with our coming reception and rebroadcast of the Space Shuttle Symposium from Washington, D.C. (see enclosed)

Sincerely,

Jack

J. Munushian

JM:sd

TAGER

P.O. Box 688 Richardson, Texas 75080
214 / 231-7211

December 22, 1977

Mr. Kenneth S. Downs
Director, Stanford ITV Network
401 Durand Building
Stanford, California 94305

Dear Ken:

This will confirm our telephone conversation today in which we discussed the possibility of TAGER's participating in the AMCEE satellite project. We would be interested in providing a broader range of continuing education programs for our industrial clientele and are intrigued with the possibilities of having such material delivered by satellite. We would, therefore, propose that TAGER be considered a potential down-site participant in the project and perhaps later, a program contributor.

Along other lines, I'd like to inqure whether provisions could not be made to enable TAGER to be considered an affiliate or associate member of AMCEE in order to have the benefit of mailings and program participation.

With every good wish for another good year, I am

Sincerely,

Gilbert A. Peters

GAP:sb

THE ASSOCIATION FOR GRADUATE EDUCATION AND RESEARCH OF NORTH TEXAS

Austin College / Bishop College / Dallas Baptist College / Southern Methodist University / Texas Christian University / Texas Wesleyan College
University of Dallas / The University of Texas at Arlington / The University of Texas at Dallas / The University of Texas Health Science Center at Dallas

STANFORD INSTRUCTIONAL TELEVISION NETWORK

School of Engineering

401 DURAND BUILDING
STANFORD, CALIFORNIA 94305

FEB 0 9 1978

Feburary 6, 1978

Dear AMCEE Representative:

As you know, we in AMCEE are in the midst of developing a plan for a satellite-based system which will expand the delivery of continuing engineering education coverage. We will begin with several pilot projects and expand the scope and scale of the system over time.

It would be very useful if you could distribute letters similar to the attached with your various industrial and/or university clients. After collecting feedback from them, a report to me by March 6th would be appreciated. The proposal deadline is March 31st, so it is imperative that I have any information which you obtain by the sixth.

Yours truly,

Ken

Kenneth S. Down
Assistant Dean

To →

2/13/78

Ken --

I can answer for several locations in Indiana: Purdue Univ. would be very interested in receiving satellite instruction & in relaying that instruction to industry locations throughout Indiana by means of the Indiana Higher Education Telecommunications System. By this means we can reach industry locations in Indianapolis, Fort Wayne, Evansville, New Albany (Louisville, Kentucky), and the South Chicago-Gary area. I estimate we could reach ~20 locations within a couple of years.

Bob Anderson
Purdue

Part 3: ALTERNATIVE APPROACHES

A. TARGET USERS AND WAYS TO REACH THEM

The target users of AMCEE educational programs and services have been identified as American industrial organizations, research laboratories and universities; and the learners have been identified as over one million practicing engineers and engineering students located within those organizations.

At least 90 percent of all programs delivered by AMCEE universities are in the shared or candid classroom format. Regularly scheduled classes are broadcast or videotaped as they are being presented in university classrooms. Faculty generally receive no additional compensation for teaching in televised courses. They participate because they know that they are providing a much needed service to their colleagues in off-campus locations and because they know that there will be a minimum of disruption created in their classrooms. The transition from teaching in a traditional classroom to teaching in a television-equipped room is insignificant to most faculty. Students adapt quickly to the television mode because it follows the traditional method of instruction to which they are accustomed. These employed engineers are motivated individuals, with clearly defined goals. They are either seeking advanced degrees or state-of-the-art technical information; both of which will aid them in advancing within their profession and within their organization. They do not need motivational stimulants designed into the television programs.

AMCEE's overall goal is to increase the national effectiveness in the (media-based) continuing education of engineers. This goal will be reached by providing improved access to a broader choice of educational programs and services. At present, access to media-based programs is through live transmission of courses over leased point-to-point microwave systems, instructional television fixed service (ITFS) networks, state educational television (ETV) networks, and courier or mail delivered videotapes.

The systems, while effective in reaching each member university's well defined constituency, are generally not able to expand their services for the following reasons: technical- the signal can travel a limited distance for a reasonable cost (leased video lines and point-to-point microwave hops are very expensive); logistical-the mail and other delivery services are slow; and financial- videotape inventory is expensive.

An ITFS signal has a broadcast range of about 30 miles. In areas such as Los Angeles and San Francisco, ITFS works well. Many high technology firms are located within the range of the University of Southern California and Stanford University systems. However, in Colorado the terrain is such that live broadcast is impractical and Colorado State University has built its off-campus program around a videotape distribution service. M.I.T., whose program is based on a catalog of studio produced engineering and science courses, depends on mail and parcel delivery services for distribution of its programs nationwide. Demand for certain of its packaged courses is so high that, in one case, 20 complete sets of 21 tapes each are required to meet circulation demands. That alone represents an inventory investment of $15-20,000. Stanford has begun a program referred to as Tutored Videotape Instruction (TVI). Videotapes of courses which are being broadcast over their ITFS system are collected and mailed daily to some ten remote locations where students are able to do graduate work for credit. Tutors must be provided by the using organization and approved by Stanford. The most troublesome aspect of that program is the slow delivery of the videotapes to the students and the slow delivery of their returning homework. A minimum of one week lag must be built into the TVI program in order to insure stability in the viewing schedules at the remote sites.

Special programs such as outstanding seminars are rarely videotaped and distributed nationally. The cost in terms of videotape inventory and staff time is one factor; waning enthusiasm and interest as time elapses from date of delivery on campus to date of availability at a remote location is another.

Because of its broad footprint, a communications satellite is capable of providing a service which is effectively responsive to the technical, logistical and financial constraints mentioned above. A signal can be transmitted from any single point to many, across the country without regard for distance and geographical barriers. The signal can be received in real time at all points in the system. And the cost of distribution can be substantially reduced on a per user basis, given an aggregated user group.

AMCEE, through the implementation of a satellite-based delivery system, will determine the extent to which this type of system will enhance its ability to meet its overall goal. This experience will be applicable to other potential user groups such as the teaching, legal and medical profession.

B. ADDITIONAL OPPORTUNITIES

AMCEE members will also have the capability to teleconference between campuses. This will allow for improved planning and coordinating of activities. Course previewing will lead to improved course quality, as AMCEE members will be able to see and critique programs under consideration for national distribution. As part of an NSF sponsored project, the University of Southern California ITFS broadcast system is being used to preview the first lecture of videotaped courses obtained from various sources from around the country. These previews are broadcast at specific hours in accordance with an advance schedule so that company training officers or interested technical personnel can conveniently determine if a particular course fills a company need. If a sufficient number of companies express an interest in a course, the course is scheduled for broadcast. AMCEE intends to expand such a service to the national level, and finds no alternative system available which can provide an economically viable previewing service.

AMCEE also wishes to implement and test three service delivery models. A satellite-based delivery system will make that test possible. One model is the Distributor model, where AMCEE members will receive and redistribute programs from across the United States to their own constituents. AMCEE universities will interface between AMCEE headquarters and their local clients. The second model will be the Direct-to-the-user plan. In this approach, AMCEE satellite headquarters will interface directly between the producers and the users in areas not now served by media-based programs. The third model to be evaluated will be the Mixed Service Area system in which both a distributor and AMCEE satellite headquarters will take and fill orders. Comparisons will be made to determine levels of user satisfaction and logistical efficiency. By testing these three distribution models early in the development of a nationwide network, AMCEE will gain experience leading to a self sustaining service.

In anticipation of the availability of a satellite-based service, AMCEE is currently in the process of developing a comprehensive catalog of educational programs, mostly the traditional videotaped courses mentioned previously, which will represent contributions from most of the current members. This catalog will be printed in a large quantity and made available to potential users both through AMCEE universities and AMCEE headquarters. AMCEE will be able to do some limited testing of the proposed distribution models by using the catalog. It will offer courses via videotape until satellite service is available. And even after that, the catalog will serve as a primary marketing tool for AMCEE. Having this experience with a national catalog will permit AMCEE to proceed with a satellite system at a more rapid rate, and will allow for an alternative delivery mode whenever more appropriate.

Part 4: OPERATIONAL PLAN

A. TYPES OF SERVICE

We should take into account the past and present programs at AMCEE members when considering future services to be offered the target audience. Fortunately, we are looking forward to enhancing and expanding an already successful service. That service is now being provided to a numerically large but relatively small percent of the engineering population of over one million. AMCEE is not proposing to provide an untried, untested or previously unsuccessful educational program. With this in mind, we expect through a satellite-based delivery service to:

1. Deliver regular classroom subjects, generally engineering and science courses at the graduate level, beyond present regional boundaries served by ITFS, ETV and slowly delivered videotape.

2. Deliver more studio produced, packaged courses to larger numbers of users on a timely and efficient bases.

3. Deliver novel special programs such as short courses, seminars, speeches and emergency engineering-related notices which are not now being made available for national distribution because of financial constraints imposed by relatively small local audiences.

Through a centralized system, the satellite will permit nationwide video broadcasting of classroom instruction from major American universities to employed engineers at industrial plants and research laboratories throughout the country. It will also permit curriculum sharing and curriculum enrichment by providing access to major university programs by smaller or developing educational institutions that desire to supplement their curricula. This concept is supported by the letter from North Carolina A & T, mentioned in Part 2 (see Example 2-1).

B. SERVICE DELIVERY

Wherever possible, the service will be delivered through existing instructional television systems. Networks such as the Appalachian Educational Satellite Program, the Colorado State University Videotape Distribution System, the Indiana Higher Education Television Network, South Carolina Educational Television Network, Southern Educational Communication Association, Stanford Instructional Television Network and University of Southern California Interactive Instructional Television System will be utilized. Figure 4-1 shows the South Carolina ETV Network as an example of a major terrestrial distribution system.

The initial program concept is centered around transmitting and receiving points at the larger universities in the country. This is because of the heavy concentrations of engineers and the industries in which they work in close proximity to centers of higher education. The industrial park, containing many high technology companies located near a major university is a nationwide phenomenon of the last twenty five years. Many of the schools already distribute technical course material locally over ITFS networks. However, this program is planned to bring companies and their technical staffs, even in remote areas, into the circle of recipients. This will be accomplished through the direct service model, where a company in a remote area will install its own earth terminal, and through the AMCEE/Agency earth station sharing model where companies and universities in reasonable proximity to an agency (such as PBS) owned earth station can receive the course materials.

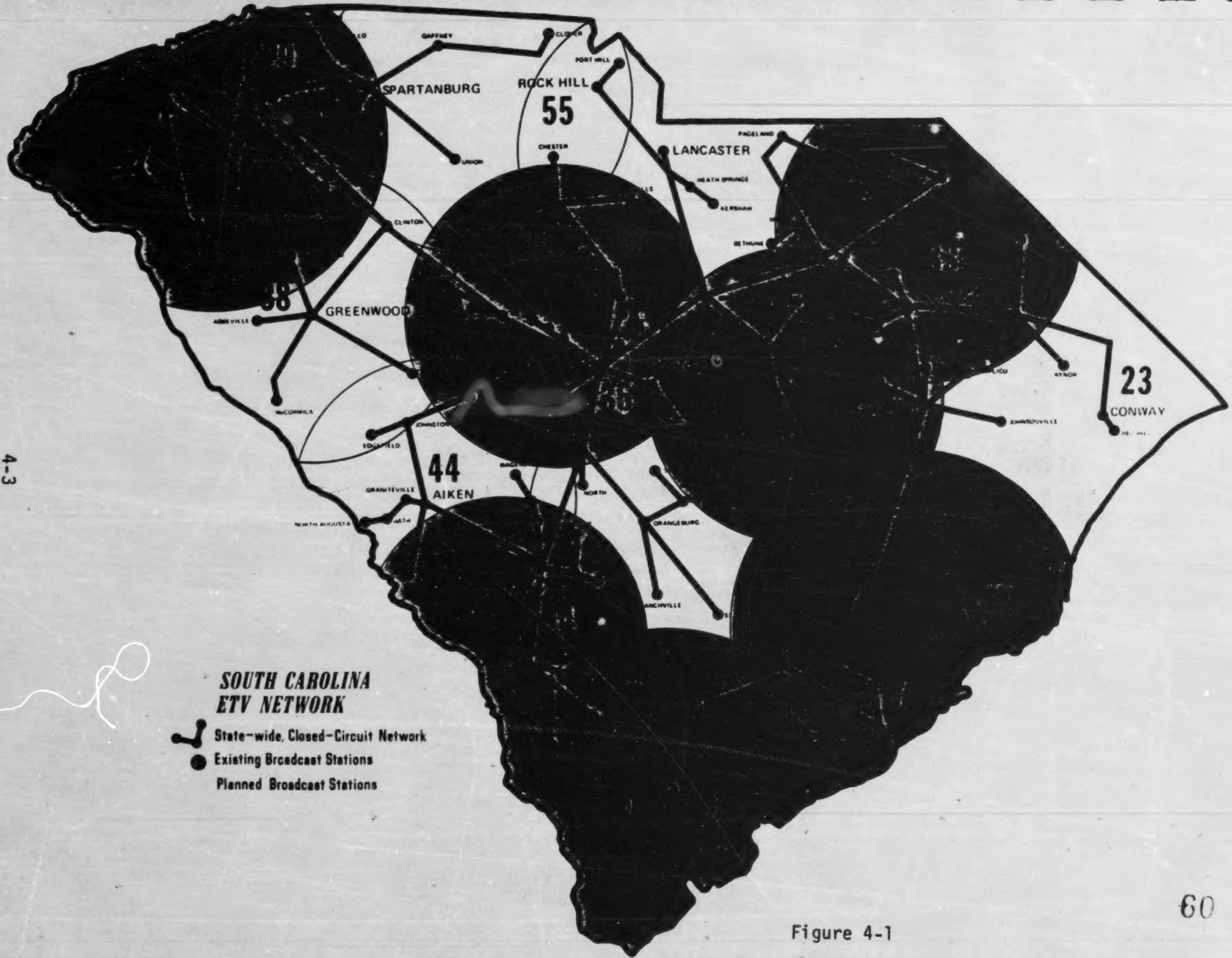

SPARTANBURG
GAFFNEY
CLOVER
FORT MILL
ROCK HILL
55
CHESTER
UNION
LANCASTER
PAGELAND
HEATH SPRINGS
KERSHAW
CLINTON
38
GREENWOOD
ABBEVILLE
McCORMICK
JOHNSTON
EDGEFIELD
44
AIKEN
GRANITEVILLE
NORTH AUGUSTA
NORTH
ORANGEBURG
AYNOR
JOHNSONVILLE
23
CONWAY
SOUTH CAROLINA
ETV NETWORK
State-wide, Closed-Circuit Network
Existing Broadcast Stations
Planned Broadcast Stations

Figure 4-1

C. MEDIA-BASED PROGRAMS

Video transmission is planned for this service because of the highly graphic nature of most instruction in engineering and science, and because of the previously highly successful experience in teaching graduate level engineering and science courses in this manner. As mentioned earlier, research faculty have been willing and able to participate in shared classroom instruction for the past five to ten years, and AMCEE members cannot ignore that. Faculty presentations with equations, charts and graphs, models and pictures can be picked up in a live classroom and transmitted or recorded without disrupting the classroom environment. Written materials on blackboard or pad can be seen by both campus and television students using the video medium.

In addition to the television presentations, examinations, lecture notes and homework assignments will be transmitted simultaneously with the video on a subcarrier which is separately demodulated and reproduced at each receiving point, producing hardcopy. Thus, each transmitted course will be in the form of a descriptive lecture with supporting visual television images plus up to 15 pages of written or printed material in hard copy format per hour.

AMCEE intends to investigate, throughout the course of this project, any technical innovations which will permit reduction of bandwidth for video transmission. While slow scan, video compression and other techniques have been and are being investigated, their commercial availability at a reasonable cost is not assured at this time. Care must be taken to introduce new technology in a way that does not produce any noticeable reduction in signal-to-noise ratio and motion fidelity. That would be unacceptable to the AMCEE target audience.

A data and document retrieval service will also be provided for each AMCEE university and industrial client. A telephone line data terminal will be used to access computer-based library services and national data banks. At this time, AMCEE has a separate proposal pending which will fund the establishment of a national data bank of engineering educational services such as abstracts, catalogs of courses, consultant services, etc. Data which have been requested will be returned over the telephone line or a document will be sent from a video transmitting university at the same time as the classroom broadcast by means of a facsimile machine and subcarrier channel mentioned above. As in the case of investigating video bandwidth reduction techniques, AMCEE intends to explore, test and implement any new satellite-based data transmission system which becomes available during the course of this proposed program.

The AMCEE system will provide for two-way teleconferencing between two or more locations. By the end of the third year of the pilot project, eight schools will be equipped with uplinks, and teleconferencing between any two will be accomplished using two satellite channels. As mentioned in Part 3, teleconferencing will lead to more effective coordination of many projects and programs. It will also permit interaction in interactive technical seminars by people at widely separated locations.

D. COURSE MATERIALS AND PROGRAMS

Programs will range from standard thirty to forty hour graduate level engineering and science subjects to short courses of five to ten hours duration. Examples of such courses appear at the end of this Part 4. The previewing capability, described in Part 3, will be useful in determining the optimal schedule for satellite service. While member schools will provide many of the courses transmitted over this national service, AMCEE is prepared to respond to requests for courses not available from regular university catalogs.

E. DETERMINING AND MEETING SPECIAL NEEDS

As an organization, AMCEE is unique in its capability to determine and meet special continuing engineering education needs. Figure 4-1 presents AMCEE's Organization Chart. Two vital functions are the Co-Management of Education and Materials Production and Utilization Committees.

The Co-Management of Education Committee will operate through a three-tiered Industrial Advisory Board (IAB) system. Local industrial representatives will meet regularly with AMCEE university officials to assess local continuing engineering education needs. From the local boards, regional advisory boards, probably numbering four, will be established to facilitate discussion of needs over a broader geographical area. And the regional boards will elect delegates to attend annual meetings where the AMCEE Board of Directors and the national IAB will convene to discuss the subject of continuing engineering education at the national level.

Feedback from the IAB system will lead to proposals from AMCEE members for new course development projects. AMCEE's Materials Production and Utilization Committee will assess the various proposals and provide loans for new course development from a revolving loan fund of $250,000 already provided by the Sloan Foundation. Through this approach, AMCEE will have available both the standard curricula of its members and the capability to produce new courses in response to evolving continuing education requirements.

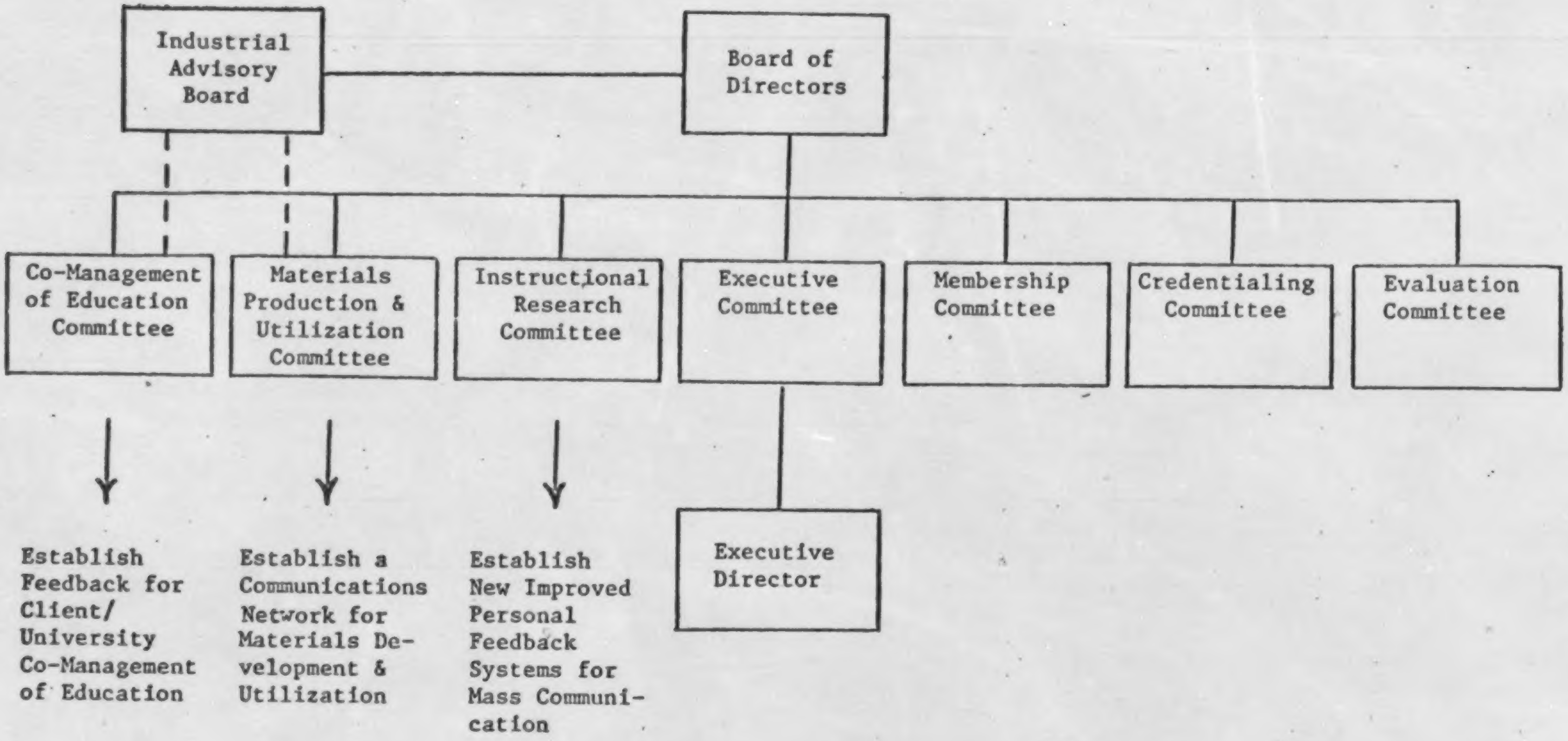

Industrial Advisory Board
Board of Directors
Co-Management of Education Committee
Materials Production & Utilization Committee
Instructional Research Committee
Executive Committee
Membership Committee
Credentialing Committee
Evaluation Committee
Establish Feedback for Client/ University Co-Management of Education
Establish a Communications Network for Materials Development & Utilization
Establish New Improved Personal Feedback Systems for Mass Communication
Executive Director

Figure 4-2 - AMCEE Organization

Following is a list of persons of national stature, distributed both geographically and by discipline, who exemplify the type of persons whom AMCEE seeks to recruit to membership on its National Industrial Advisory Board.

Donald Hammond
Director
Physical Electronics Laboratory
Hewlett Packard Research Labs,
Palo Alto, California

Charles H. Wilcox
Director Engineering
Hugues Aircraft Company
Culver City, California 90230

Donald Miller
Director, Human Resources
IBM Company
San Jose, California

J. H. Zettel
Vice President
Johns-Manville Sales Corporation
Research and Development Center
Denver, Colorado

Robert E. Wesslund
Vice President and Assistant to the President
Control Data Company
Minneapolis, MINN

Robert M. Adams
Vice President of Research and Development
3-M Company
St. Paul, MINN

Robert Widmer
Vice President, Science and Engineering
General Dynamics
Pierre Leelede Center
St. Louis, Missouri 63105

Donald R. Beall
President
Electronics Operations
Rockwell International
Dallas, Texas

Mark Shepherd, Jr.
Chairman of the Board
Texas Instruments Incorporated
Dallas, Texas

Arthur M. Johnsen
Director, Metallurgical Research
ARMCO Steel
Middletown, OH

Paul F. Chenea
Vice President in Charge of Research Laboratories
General Motors Corporation
Warren, Michigan

Walter Cherry
President
Cherry Electrical Products
Waukegan, Illinois

George R. Jasny
Director of Engineering
Union Carbide-Corporation-Nuclear Div.
Oak Ridge, TENN

F. Cooper, Jr.
Manager Engineering
Aerospace Electronic Systems Department
General Electric Company
Utica, New York

Robert Ormsby
President Lockheed Georgia Company
Marietta, Georgia

F. OPERATING MODES

The system will operate in three primary modes:

1. Video transmission of courses, seminars and special events from campuses to participants who are attending as part of the live audience; and to videorecorders for storage and later replay.

2. Materials distribution service, similar to the highly successfull service offered in the Satellite Technology Demonstration in the Rocky Mountain states. Prerecorded materials will be sent from one point (AMCEE member uplink) to many users (AMCEE downlinks) for off-the-air recording and use at a convenient time.

3. Interactive teleconferences between AMCEE members.

Designing schedules to include all three modes will lead to fuller and more cost effective use of the satellite. Out of the twenty four hours available, there are seven, and at most nine, hours during which live transmissions will reach people coast-to-coast while they are at work. That can be seen on the table below.

Eastern	10	11	12	1	2	3	4	5	6
Central	9	10	11	12	1	2	3	4	5
Mountain	8	9	10	11	12	1	2	3	4
Pacific	7 am	8	9	10	11	12	1	2	3 pm

It is during the hours 8am to 5pm that live courses, special events and seminars will be transmitted nationwide. Where activities occur outside that window, recipients will have the choice of live viewing or videotape replay. Late afternoon seminars from the West coast might be used as professional society programs on the East coast.

Using the materials distribution mode, many courses will be videotape recorded for distribution during the hours 11 pm Pacific to 7 am Eastern time as shown below. That will enable AMCEE to benefit from lower off-peak satellite use rates.

						am
Eastern	2	3	4	5	6	7
Central	1	2	3	4	5	6
Mountain	12	1	2	3	4	5
Pacific	11	12	1	2	3	4
	pm					am

During this period, automated, unattended, off-the-air recorders will receive satellite distributed materials. Such materials will be available for viewing at the receiving site or redistributed over terrestrial systems such as ITFS or ETV.

A typical weekly schedule might, at some point, look like the following.

Time/Day		Monday	Tuesday	Wednesday	Thursday	Friday
Pacific	-Eastern	(broadcasts of both live and prerecorded courses)				
7 am	10 am	Stanford	Kentucky	Stanford	Kentucky	Stanford
8	11	Auburn	So. Car.	Auburn	So. Car.	Auburn
9	Noon	So. Cal.	Purdue	So. Cal.	Purdue	So. Cal.
10	1 pm	M.I.T	Michigan	M.I.T.	Michigan	M.I.T.
11	2	Seminar	Seminar	Seminar	Seminar	Previews
Noon	3	Illinois	Georgia T.	Illinois	Georgia T.	Illinois
1 pm	4	Colo. St.	Case West.	Colo. St.	Case West.	Colo. St.
2	5	Minnesota	So. Meth.	Minnesota	So. Meth.	Minnesota
3	6 pm	Cal-Davis	Seminar	Cal-Davis	Seminar	Cal-Davis
Break in Service						
11 pm	2 am	So. Cal.	Stanford	So. Cal.	Stanford	So. Cal.

(The above would be night transmissions of videotaped courses)

G. MARKETING AMCEE SERVICES

Key to the success of the AMCEE satellite-based delivery system is a large user audience. Communicating the availability of this new service will attract industrial participation and permit AMCEE to reach the thousands of practicing engineers in need of continuing engineering education.

An integrated marketing strategy is planned to insure a rapid build up of clients during the first few years of the project. Each university that is a satellite downlink will be expected to recruit active participants into the program. In addition, the executive director will be assigned responsibility for recruiting new users; and a marketing consultant will be used to supplement the sales activity.

Taped and candid classroom video course offerings of AMCEE universities will be consolidated in a printed and data-based catalog. The catalog will list course descriptions, source institution, course duration, textbook information, use fee and other relevant data. The printed catalog will be an essential element of the marketing plan. It will serve both as a promotional and operational tool. Promotionally, the catalog will impact on potential clients through its breadth of courses. Operationally, the catalog will be needed for client course selection. Clients will have the option of ordering through their data terminals, by mail or by telephone.

It is projected that clients will be recruited chiefly through direct contact. During the first year, most marketing effort will reflect this projection. Most of the related elements of the marketing program such as brochures, space ads and letters will be aimed at supporting direct sales and not as activities designed to generate sales of their own.

Many of the potential users of the satellite program are already either AMCEE member university participants or users of packaged videocassette programs. They will be a highly receptive audience, but one that should be approached with intense pre-planning, superb sales tools, and strong follow-up.

To gain maximum direct sales thrust, the AMCEE representatives calling on potential users should have a descriptive brochure and the AMCEE master catalog. The AMCEE representatives should be backed up with a personalized direct mail campaign and strong customer services follow-up support at AMCEE headquarters.

An arresting and effective promotional brochure will be developed in the first year. It should include the following: a description of how the system works; equipment specifications; prices; an appeal to the user that they are getting in on a cutting-edge technological development.

Marketing letters of all kinds will be developed and mailed regularly to key prospects. These letters will assist the direct marketing representative and will help in the follow-up steps. Space advertising in technical journals, professional society journals and similar media will also be valuable in generating interest and developing leads.

Developing a base of users from 40 the first year to 320 by the end of the fourth year is not an insurmountable task. However, it is key to the overall success of AMCEE's satellite-based program. While we know that the demand for AMCEE services exists, communicating the availability of this new and different educational program will require the application of all of the best marketing techniques. It is imperative that this aspect of the total project be given appropriate emphasis. The sales activities described here are expected to result in large numbers of clients enrolling students in a wide variety of AMCEE sponsored courses. Table 4-1 shows the growth of the number of clients and courses that are expected to be part of the system each year for four years. These projections are used in the estimates for the AMCEE annual operating budget. There is a constraining relationship between the number of clients and courses, since the number of courses each client will utilize, on the average, must be realistic. Also, the number of clients taking each course must be realistic. This results in a requirement for a fairly large, varied and attractive list of courses and a large number of clients. However, the very nature of this system and the number of locations it can reach make the projections seem quite attainable. This is especially true for a system which operates independently at 14/2.5 GHz as well as through the shared 6/4 GHz system.

TABLE 4-1

Marketing Projections

YEAR	1	2	3	4
Number of Clients	40	150	240	320
Number of Receive Sites	7+	17+	17+	17+
Number of Courses/Year	10	40	65	80
Average Number of Clients Taking Any One Course	12	15	18.5	24
Average Number of Courses Each Client Takes Per Year	3	4	5	6

H. SATELLITE CONSIDERATIONS

Sections A and B of this Operational Plan described the types of services and service delivery considerations proposed by AMCEE. It was suggested that services be delivered either through existing terrestrial networks or, when necessary, direct to the user. This section describes various system configurations and proposes specific satellite alternatives.

Figure 4-2 shows a conceptual block diagram of what this proposal refers to as an independent system. Earth stations are located at the AMCEE campuses and no other agency's equipment is involved except for the satellite. Figure 4-3 shows the dependent, or shared, system where AMCEE programs are transmitted through the earth terminal antennas belonging to an agency such as the Public Broadcasting Service (PBS) or the National Public Radio (NPR). The antennas and receiver front-ends in this equipment are broadband and therefore cover the entire satellite band. Filters will be installed which will separate AMCEE transponder bands from the other signals and properly route them to the AMCEE control point. Figure 4-2 also shows the direct service model where a participating company installs an earth station on its own premises (e.g. Boeing and NASA, Examples 2-3 and 2-4, pages and of Part 2). It is apparent that through one or another of these receiving terminal models, the AMCEE program can reach almost any company or interested group in the nation. Figures 4-4 and 4-5 are maps of the NPR and PBS systems showing studio and earth station sites.

The pilot project for the AMCEE distribution system is designed to operate initially on an experimental basis using the WESTAR I satellite and sharing a portion of the National Public Radio satellite distribution network.

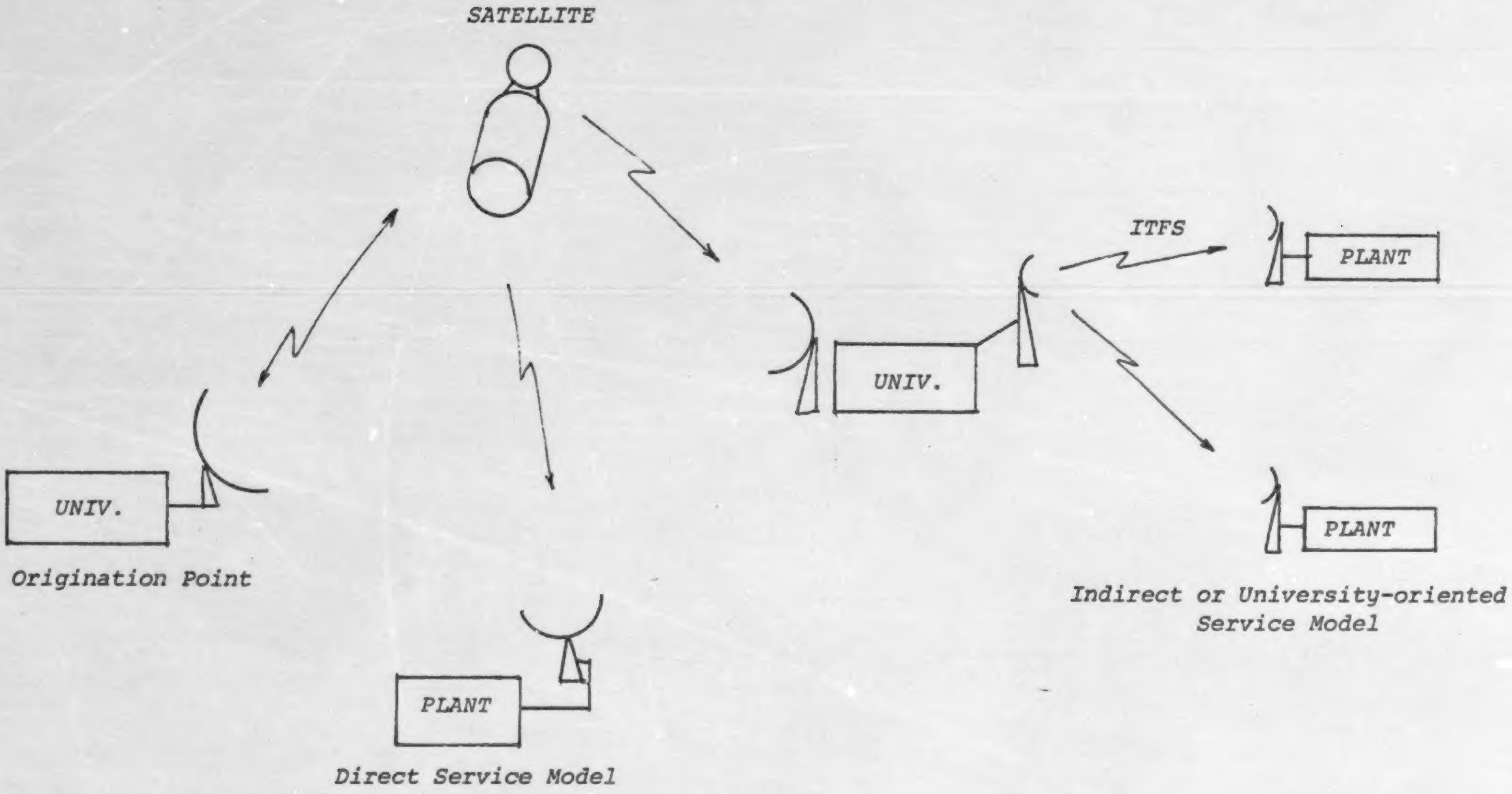

SATELLITE
ITFS
PLANT
UNIV.
PLANT
UNIV.
Origination Point
PLANT
Direct Service Model
Indirect or University-oriented Service Model

Fig. 4-3. Independent System Model

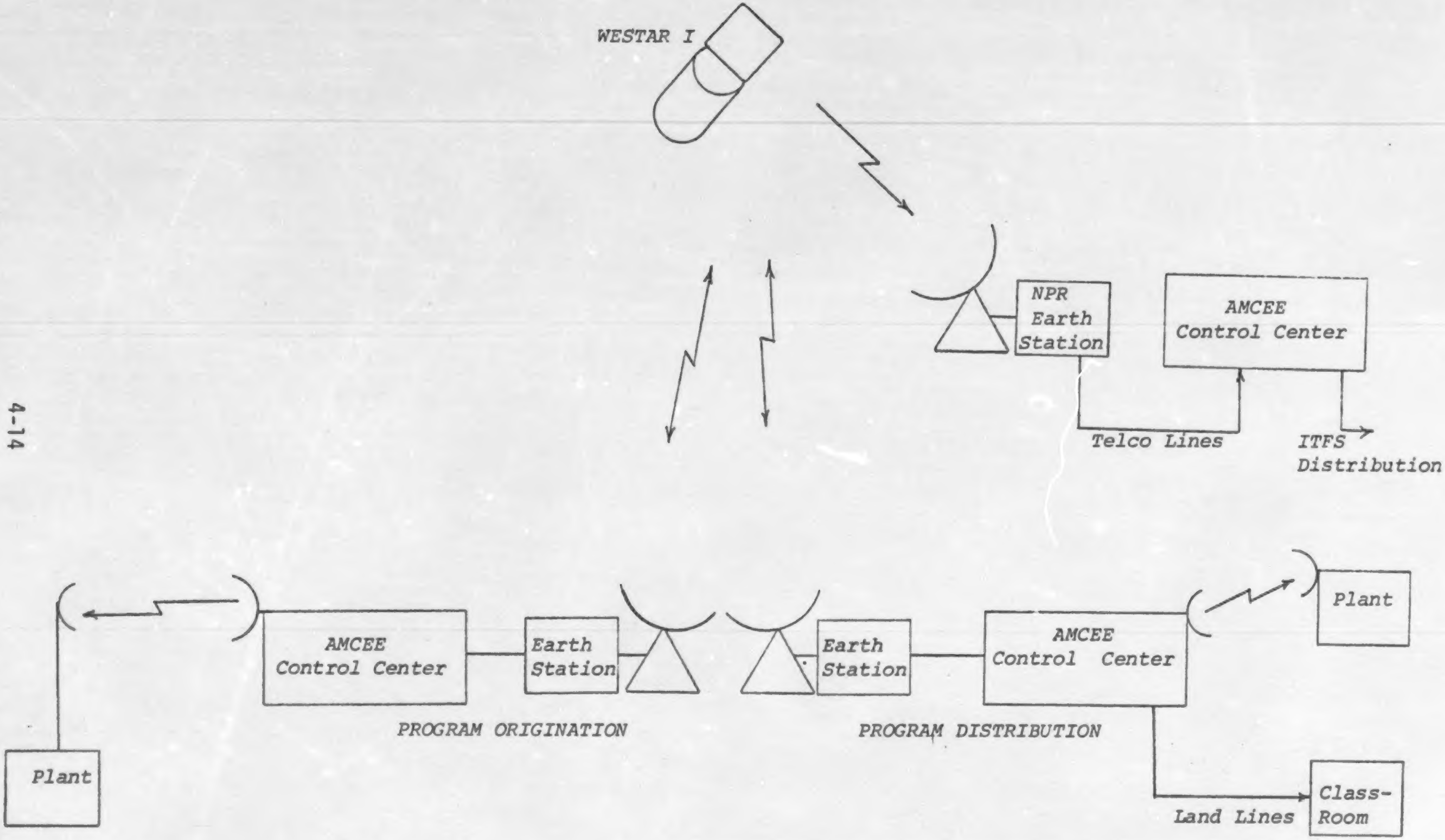

WESTAR I
NPR Earth Station
AMCEE Control Center
Telco Lines
ITFS Distribution
Plant
AMCEE Control Center
Earth Station
Earth Station
AMCEE Control Center
Plant
PROGRAM ORIGINATION
PROGRAM DISTRIBUTION
Land Lines
Class-Room

Fig. 4-4. Dependent System Using NPR.

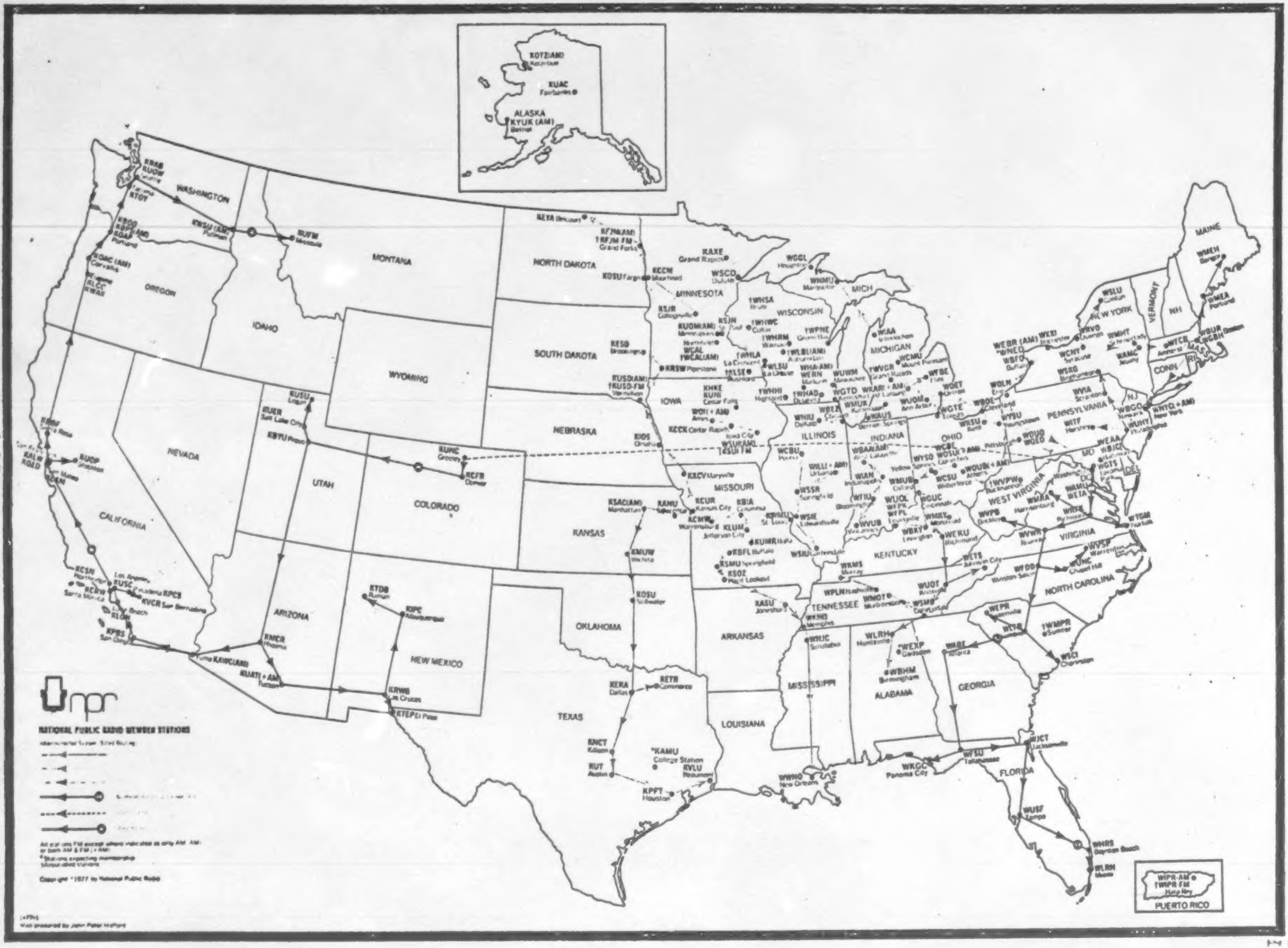

ALASKA
KOTZ(AM) Kotzebue
KUAC Fairbanks
KYUK (AM) Bethel
WASHINGTON
OREGON
IDAHO
MONTANA
WYOMING
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
MINNESOTA
WISCONSIN
MICHIGAN
MICH
IOWA
ILLINOIS
INDIANA
OHIO
NEVADA
CALIFORNIA
UTAH
COLORADO
KANSAS
MISSOURI
KENTUCKY
WEST VIRGINIA
VIRGINIA
PENNSYLVANIA
NEW YORK
VERMONT
NH
MAINE
MASS
CONN
RI
NJ
MD
DEL
DC
ARIZONA
NEW MEXICO
OKLAHOMA
TEXAS
ARKANSAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
TENNESSEE
NORTH CAROLINA
FLORIDA
PUERTO RICO
WIPR-AM
†WIPR-FM
Hato Rey
npr
NATIONAL PUBLIC RADIO MEMBER STATIONS
Copyright ©1977 by National Public Radio
Map produced by John Peter Hoffman

Figure 4-5

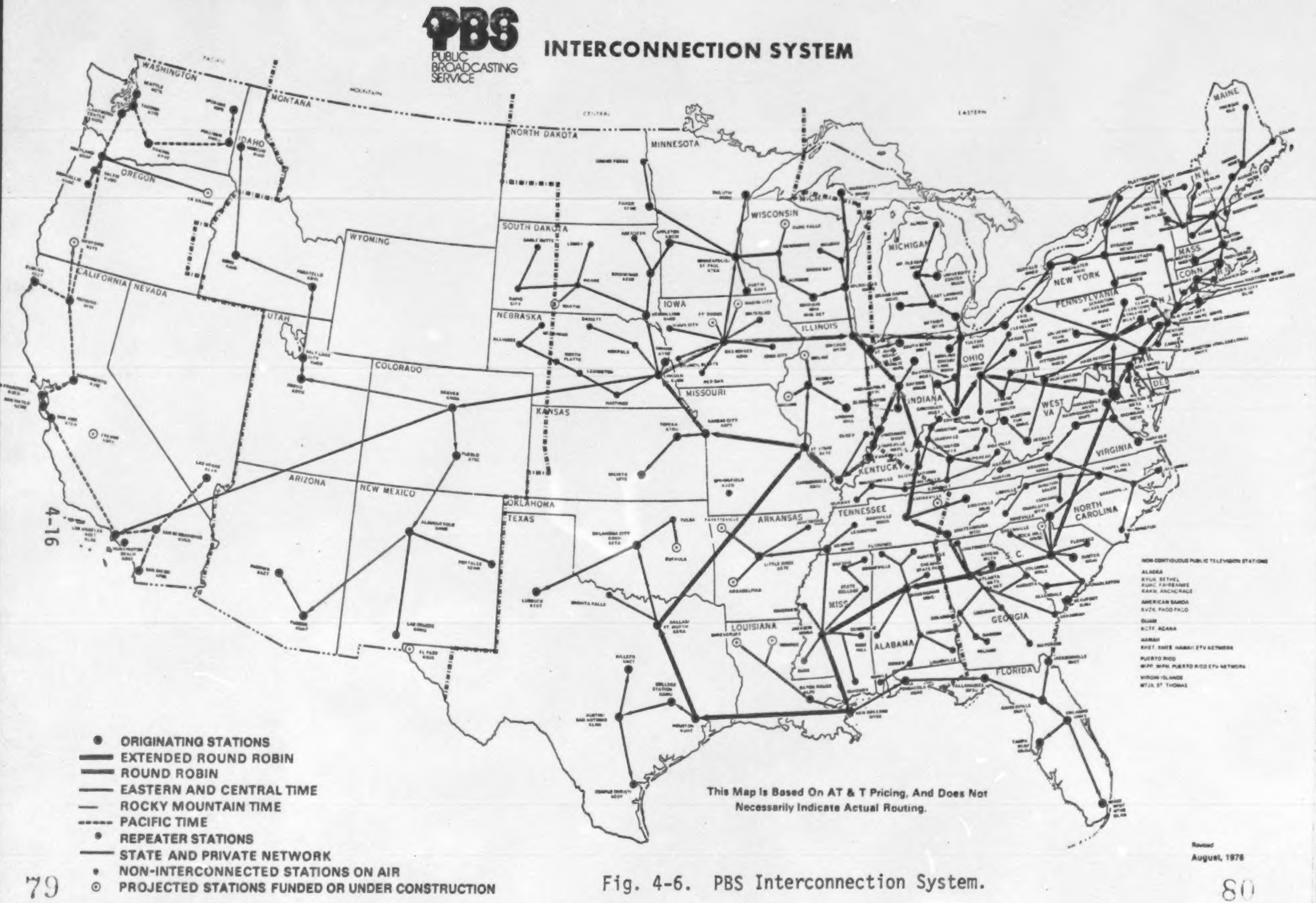

PBS
PUBLIC BROADCASTING SERVICE
INTERCONNECTION SYSTEM
PACIFIC
MOUNTAIN
CENTRAL
EASTERN
WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
COLORADO
ARIZONA
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
WISCONSIN
ILLINOIS
MICH
MICHIGAN
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISS
ALABAMA
GEORGIA
FLORIDA
S. C.
NORTH CAROLINA
VIRGINIA
WEST VA
PENNSYLVANIA
NEW YORK
N J
DEL
VT
N H
MAINE
MASS
CONN
R I
NON-CONTIGUOUS PUBLIC TELEVISION STATIONS
ALASKA
KYUK BETHEL
KUAC FAIRBANKS
KAKM ANCHORAGE
AMERICAN SAMOA
KVZK PAGO PAGO
GUAM
KGTF AGANA
HAWAII
KHET, KMEB HAWAII ETV NETWORK
PUERTO RICO
WIPR, WIPM PUERTO RICO ETV NETWORK
VIRGIN ISLANDS
WTJX ST THOMAS
● ORIGINATING STATIONS
EXTENDED ROUND ROBIN
ROUND ROBIN
EASTERN AND CENTRAL TIME
ROCKY MOUNTAIN TIME
PACIFIC TIME
● REPEATER STATIONS
STATE AND PRIVATE NETWORK
• NON-INTERCONNECTED STATIONS ON AIR
⊙ PROJECTED STATIONS FUNDED OR UNDER CONSTRUCTION
This Map Is Based On AT & T Pricing, And Does Not Necessarily Indicate Actual Routing.
Revised
August, 1976

Fig. 4-6. PBS Interconnection System.

Two independent AMCEE transmit/receive stations operating at 6/4 GHz will be installed in the first year of the project; one at Stanford University near Palo Alto, California, and the other at the University of South Carolina in Columbia, South Carolina. Five receive-only terminals operating at 4GHz will be established using NPR satellite terminals within one to two miles of the AMCEE university control points. Sharing the NPR or PBS satellite network wherever possible is a logical decision, since there are NPR/PBS studios on many of the college campuses in the United States, and the NPR/PBS system is a public service and educational communication system.

In addition to the AMCEE locations mentioned above, it is anticipated that negotiations will begin during the first year to place receive-only independent earth stations at Boeing, NASA-Johnson Space Center, North Carolina A & T State University, Greensboro, North Carolina. Funding for these locations will not be requested in this proposal.

The long range plan for this project is to use the 14/2.5 GHz public service frequency bands and the SYNCOM IV satellite when it becomes available in the spring of 1980. Before that time, i.e., the first year of the project, the AMCEE network will operate at 6/4 GHz using WESTAR I, sharing NPR earth stations where feasible. Even after SYNCOM IV is in orbit, an interconnect into the NPR/PBS system will be maintained by installing a 2.5 GHz receiving terminal and a 6 GHz transmitter at the NPR/PBS Main Origination Terminal in Bren Mar, Virginia. Through this link, the AMCEE system will continue to have access to the schools and industries near the 200-plus NPR/PBS earth station locations.

The SYNCOM IV satellite is being designed as an educational and public service satellite, and the frequency bands planned are designated for public service applications. These frequency bands have been selected for ultimate use for this project not only because they are public service bands, but also because the relatively small amount of traffic presently on these frequencies means that FCC frequency coordination and clearance will not be a problem. Also, the 14 GHz uplink frequency means that small antennas can be used while keeping the EIRP high, and the downlink frequency means that receiving equipment will be low cost. It is important that downlink equipment be minimum cost, since this will keep the direct-service model attractive to industrial clients.

The antenna for the 14/2.5 GHz terminals will be 3 meters (10 feet) in diameter, thus making their installation at campuses and on industrial premises simple. One aspect of this system that has been carefully considered is the aesthetic or environmental impact of the installation. A 3-meter antenna can quite easily be installed in parking lots, behind buildings, in rooftop wells or shallow ground depressions with a minimum visible effect on the environment. It will be the intent to install antennas as close as possible to the AMCEE control centers at each campus so as to minimize cable and waveguide runs or auxiliary terrestrial link requirements.

There will be some campuses where the AMCEE control centers, and therefore the AMCEE earth station antenna, will be located in very close proximity to the campus National Public Radio or Public Broadcasting Service earth station. Campus authorities, zoning regulations, or environmental concerns may prevent the locating of another dish antenna close to one already installed. These AMCEE terminals will share the NPR or PBS antenna already in place and will continue to use that receiving point through the NPR/PBS link even after the main AMCEE operation cuts over to 14/2.5 GHz.

The transmit/receive terminal equipment will be connected as shown in Figure 4-7. The video program material from the AMCEE classroom will be presented to the video modulator/upconverter where the video signal modulates the RF wave and is then converted to the microwave frequency band. The high power amplifier (HPA) boosts the modulated microwave carrier signal to the power level needed for transmission to the satellite. The HPA may be located in the studio control center or, in some cases, it may be located in a shelter at a point closer to the antenna. Any supporting notes or hardcopy needed by the students will be run through the facsimile machine at the transmitting studio where the hardcopy is converted to an audio frequency digital signal. This signal goes to the FM transmitter module where it is converted to a frequency level just above the video baseband. This signal is then placed on the outgoing video signal so that it is transmitted as a subcarrier riding along with the video signal. At the receiver this subcarrier is separately demodulated and put into the facsimile machine for reproduction onto paper. The subcarrier is not seen on the video screen even though it is simultaneously transmitted with the TV signal. Ten to fifteen pages of printed material can be transmitted with each one hour video program in this manner.

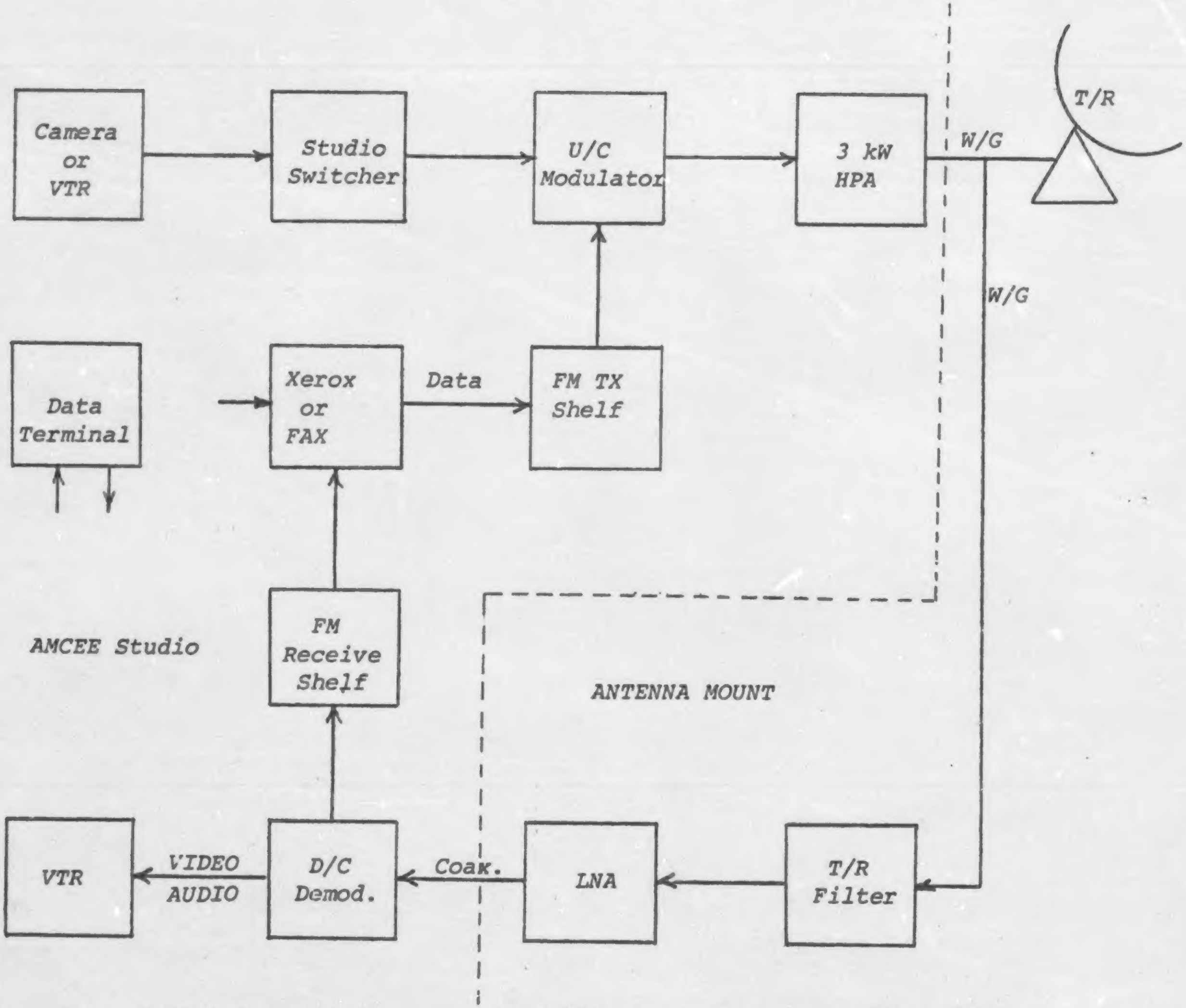

Camera or VTR
Studio Switcher
U/C Modulator
3 kW HPA
W/G
T/R
W/G
Data Terminal
Xerox or FAX
Data
FM TX Shelf
AMCEE Studio
FM Receive Shelf
ANTENNA MOUNT
VTR
VIDEO
AUDIO
D/C Demod.
Coax.
LNA
T/R Filter

Fig. 4-7. Transmit/Receive Video, Indepehdent (Stanford, U. of So. Carolina).

I. THE FIRST YEAR

In the first year of the pilot program, receive-only terminals will be established at five AMCee schools by using the nearby NPR Satellite Interconnection System earth stations. These five schools are:

Colorado State University
Georgia Institute of Technology
Purdue University
University of Kentucky
University of Michigan

The AMCEE control center at each of these schools is within one to two miles (and in some cases, only 2,000 feet) of the NPR studio and its associated earth station. Telephone company video lines will be leased or rented to carry the received AMCEE signal from the NPR terminal to the AMCEE central control point. The AMCEE downconverter/demodulator will most likely be installed in a rack at the NPR earth station, and the interconnect will carry the signal at IF frequencies or at baseband to the AMCEE control center. Costs for the telephone lines have been solicited from the local telephone company at each school and are included in the cost estimates. Figure 4-8 is a block diagram of the shared receive-only terminal showing the equipment locations at the NPR terminal and at the AMCEE control center.

J. SUBSEQUENT YEARS

In summary, the first year of the project will see the installation of 6/4 GHz equipment in an independent (i.e., non-shared) transmit/receive configuration at two schools, and receive-only equipment in a shared-with-NPR configuration at five more schools for a total of seven terminals. In the

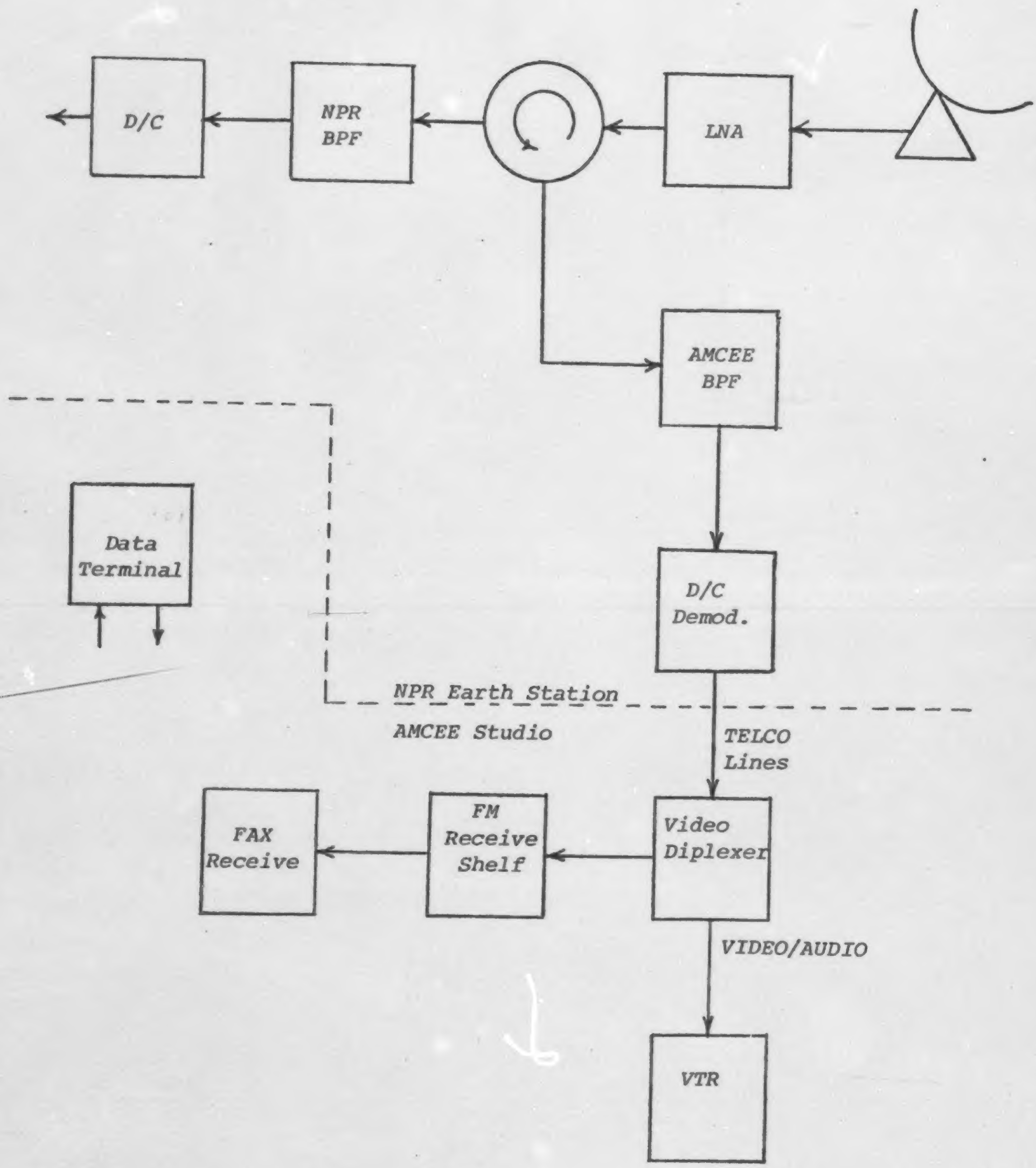

D/C
NPR BPF
LNA
AMCEE BPF
Data Terminal
D/C Demod.
NPR Earth Station
AMCEE Studio
TELCO Lines
FAX Receive
FM Receive Shelf
Video Diplexer
VIDEO/AUDIO
VTR

Fig. 4-8. Receive-Only Video, Shared with NPR (CSU, Purdue, University of Kentucky, University of Michigan, Georgia Tech.

second year of the project, three additional AMCEE schools (M.I.T., University of Southern California, and Illinois Institute of Technology) will be equipped with independent 14/2.5 GHz transmit/receive terminals, and seven more AMCEE schools will be equipped with independent 2.5 GHz receive-only terminals. Two industrial/research sites (probably NASA-Johnson Space Center and Boeing Company) and North Carolina A & T will be equipped with receive-only terminals using non-NPR funds.

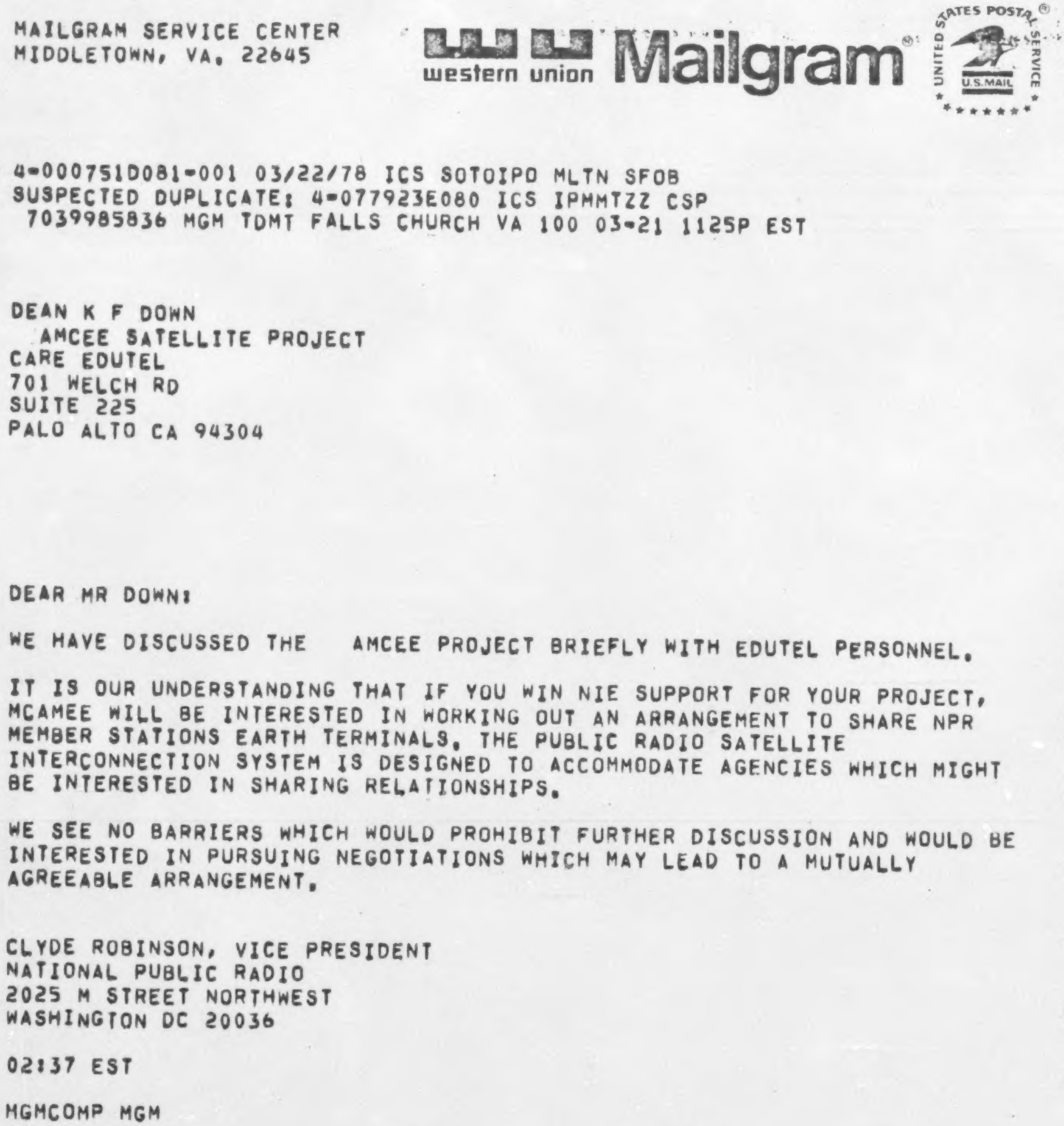
In addition, the NPR/PBS Main Origination Terminal near Washington, D.C. will be equipped with 2.5 GHz receiving equipment and a 6 GHz transmitter. This installation will allow the AMCEE 14/2.5 GHz transmissions to be received and crossed-over into the NPR/PBS system at 6/4 GHz. This crosslink will be maintained even after the main AMCEE system begins operation at 14/2.5 GHz. In the third year of the pilot project, the 6/4 GHz transmit/receive terminals at Stanford and the University of South Carolina installed in the first year will be converted to 14/2.5 GHz. Three of the original 4 GHz shared receive-only terminals (i.e., those at Colorado State, Georgia Tech and Michigan) will be equipped with 14 GHz uplinks at the AMCEE control centers. This will bring the total number of 14 GHz uplink schools to eight and the receive-only schools to ten. The interconnect into the NPR/PBS system will remain and will allow a decision at each subsequent planned receiving point as to whether to install 2.5 GHz direct receiving equipment or whether to share a nearby 4 GHz NPR/PBS earth terminal.

This operational plan envisions use of the WESTAR I satellite during 1978 and 1979 while transponder capacity is expected to be available during daytime hours. By 1980, when NPR/PBS expect to be using most of their daytime leased capacity on WESTAR I, the main AMCEE traffic will shift to SYNCOM IV and the AMCEE traffic on WESTAR will shift to predominantly off-peak hour operation. Figure 4-9 is a letter from CPB expressing interest in this project and willingness to work out an interconnection link and shared operation.

K. OPERATIONAL PARAMETERS

The system design of a satellite network requires certain calculations to determine basic system parameters and to establish operating feasibility. The calculation of link budgets and carrier-to-noise ratios results in the required antenna sizes, transmitter power levels, and receiver noise figures. Table 4-1 shows the link budgets for video operation both at 14/2.5 and at 6/4 GHz. The higher satellite transponder transfer gain in SYNCOM IV is a major factor in its attractiveness.

The project initially uses 4.5 meter antennas for the 6/4 GHz transmit/receive sites. At the time of this writing, the FCC has not approved 4.5 meter antennas for video transmission. While video uplinks from 4.5 meter antennas may cause unacceptable co-channel interference to an adjacent satellite 4° away in orbit, during the first year of operation no satellites are expected to be in this close proximity to WESTAR I. Therefore, the initial applications for frequence clearance for the 4.5 meter uplink sites will be for operation on an experimental basis. The plan to convert these sites to 14/2.5 GHz in the third year will circumvent any problem that might arise if this clearance cannot be made permanent. An alternate plan is discussed in Part 5 in the event that clearance for the 4.5 meter terminals is not forthcoming. The 4.5 meter antenna will continue to be used at



MAILGRAM SERVICE CENTER
MIDDLETOWN, VA. 22645

western union Mailgram

UNITED STATES POSTAL SERVICE
U.S.MAIL

4-000751D081-001 03/22/78 ICS SOTOIPO MLTN SFOB
SUSPECTED DUPLICATE: 4-077923E080 ICS IPMMTZZ CSP
7039985836 MGM TDMT FALLS CHURCH VA 100 03-21 1125P EST

DEAN K F DOWN
AMCEE SATELLITE PROJECT
CARE EDUTEL
701 WELCH RD
SUITE 225
PALO ALTO CA 94304

DEAR MR DOWN:

WE HAVE DISCUSSED THE AMCEE PROJECT BRIEFLY WITH EDUTEL PERSONNEL.

IT IS OUR UNDERSTANDING THAT IF YOU WIN NIE SUPPORT FOR YOUR PROJECT, MCAMEE WILL BE INTERESTED IN WORKING OUT AN ARRANGEMENT TO SHARE NPR MEMBER STATIONS EARTH TERMINALS. THE PUBLIC RADIO SATELLITE INTERCONNECTION SYSTEM IS DESIGNED TO ACCOMMODATE AGENCIES WHICH MIGHT BE INTERESTED IN SHARING RELATIONSHIPS.

WE SEE NO BARRIERS WHICH WOULD PROHIBIT FURTHER DISCUSSION AND WOULD BE INTERESTED IN PURSUING NEGOTIATIONS WHICH MAY LEAD TO A MUTUALLY AGREEABLE ARRANGEMENT.

CLYDE ROBINSON, VICE PRESIDENT
NATIONAL PUBLIC RADIO
2025 M STREET NORTHWEST
WASHINGTON DC 20036

02:37 EST

MGMCOMP MGM

Fig. 4-9. NPR Letter

TABLE 4-1

Link Budgets for Independent System Video Distribution

	14/2.5 GHz	6/4 GHz
Uplink Transmission	1000 watts	3000 watts
Antenna Size	3.0 meters	4.5 meters
Transmit Antenna Gain	50 dB	46.5 dB
Uplink Spreading Loss	163.1 dB	163.1 dB
Uplink Rain Loss	8 dB	2 dB
Transmit Transfer Gain	132 dBW/(dBW/m^2)	117 dBW/(dBW/m^2)
Satellite Downlink EIRP	40.9 dBW	33.2 dBW
Downlink Path Loss	192.6 dB	196.5 dB
Downlink Margin	1 dB	1.5 dB
Receive Antenna Size	3.0 meters	4.5 meters
Receive LNA Noise Temperature	250°K	125°K
Receive G/T	11 dB/°K	21.4 dB/°K
Bandwidth	74.7 dB	74.7 dB
Downlink C/N (or E_b/N_0)	12.2 dB	10.5 dB

these two sites with only the feed being changed in the third year to allow operation at the new frequency band. The calculations of Table 4-1 show that the receive terminal carrier-to-noise ratios are more than adequate at 14/2.5 GHz and they are acceptable at 6/4 GHz.

Reliability factors and weather margins have been considered in the calculations of Table 4-1. Equipment MTBF data reveals that overall system equipment reliability is expected to be 0.9950 or about 44 hours per year outage time because of equipment failures. Weather margins bring the overall system availability to 0.9930.

Example 4-1

stanford instructional television network

schedule of classes

spring 1978

LELAND STANFORD JUNIOR UNIVERSITY
ORGANIZED 1891

AERONAUTICS AND ASTRONAUTICS

Number AA 278B PROFESSOR Schaecter UNITS 3

Title OPTIMAL ESTIMATION AND CONTROL LOGIC IN THE PRESENCE OF NOISE

Description Review of probability theory and Gauss-Markov random processes. Estimation based on weighted least squares. Recursive filtering, smoothing, and interpolation for linear systems with additive Gaussian noise. Synthesis of optimal feedback, controllers in the presence of uncertainty. PREREQUISITE: AA 278A and STAT 116E (or equivalent)

Schedule TTh 8:00-9:15 ROOM SK 193 CHANNEL 8

Textbook Bryson and Ho, Applied Optimal Control

Number AA 297 PROFESSOR Debra UNITS 1

Title SEMINAR IN FLIGHT MECHANICS & CONTROL

Description Problems in all branches of vehicle control, guidance and instrumentation. The purpose of the seminar is to extend the subject matter of the classroom and to give students who are planning or engaged in thesis research an opportunity to become acquainted with the work of other researchers, both on and off campus. Graduate students with an interest in automatic control applications in flight mechanics, guidance, navigation and mechanical design of control systems normally attend. Others are invited. Registration for a unit of credit, without letter grade, is optional; a letter grade is given for students who make presentations.

Schedule Wed. 4:15-5:30 ROOM SK 193 CHANNEL 8

CIVIL ENGINEERING

Number CE 282B PROFESSOR Shah UNITS 3

Title EARTHQUAKE ENGINEERING II

Description Earthquake motions and their engineering interpretations; strong ground motion studies; design spectrum; importance of dynamic analysis of structures; geologic and soil engineering problems; soil liquefication; soil-foundation-structure interaction; stability of dams and natural slopes; design of structures to minimize earthquake damage; risk analyses. PREREQUISITE: CE 282A or consent of instructor.

Schedule MWF 9:00-9:50 ROOM SK 193 CHANNEL 8

Textbook No required text

COURSES TO BE TELEVISED
SPRING QUARTER 1977-1978 OVER THE
STANFORD INSTRUCTIONAL TELEVISION NETWORK

AERO-ASTRO

AA	278B	Optimal Estimation & Control Logic in the Presence of Noise	TTh	8:00-9:15	CH 8	SK 193	Schaecter
AA	297	Seminar in Flight Mechanics & Control	Wed.	4:15-5:30	CH 8	SK 193	Debra

CIVIL ENGINEERING

CE	282B	Earthquake Engineering II	MWF	9:00-9:50	CH 8	SK 193	Shah

COMPUTER SCIENCE

CS	111	Intro to Computer Organization, Machine & Assembly Languages	MWF	1:15-2:05	CH 8	SK 193	Wiederhold
CS	140B	Systems Programming	TTh	9:30-10:45	CH 12	ERL 320	Hennessy
CS	154	Formal Languages	MWF	10:00-10:50	CH 8	SK 193	F. Yao
CS	235	Statistical Computing	MWF	2:15-3:05	CH 12	ERL 320	Golub/Diaconis
CS	240B	Compiler Construction	TTh	9:30-10:45	CH 8	SK 193	Barth
CS	249	Introduction to Distributed Computing	TTh	11:00-12:15	CH 10	T 156	Metcalf, Shock, Wiederhold
CS	237C	Advanced Numerical Analysis	MWF	3:15-4:05	CH 10	T 156	Oliger
CS	251	Probabilistic Algorithms	MWF	3:15-4:05	CH 8	SK 193	A. Yao
CS	247	Computer System Evaluation	MWF	11:00-11:50	CH 3	SK 191	Kumar

ENGLISH

ENG	50	Poetry	MWF	9:00-9:50	CH 10	T 156	Middlebrook

4-28b

association for
continuing education

A VIDEOTAPE COURSE

MICROWAVE TUBES and SOLID STATE DEVICES

Course Description

Microwave Tubes and Solid State Devices consists of 22 one hour long sessions. All of the new and important microwave tubes and solid state devices are covered. Theory of operation, performance limits, representative products, and typical applications are presented for each device type. Comparisons between devices are frequently made, and the best choice of microwave device for various applications is presented.

The course is intended for anyone who needs to know about microwave devices—engineers, technicians, or non-technical managers. 1976.

Topics

1. The microwave device problem.
2. Characteristics of amplifiers and oscillators.
3. Gridded tubes.
4. Kylstrons.
5. Traveling Wave Tubes.
6. Crossed field amplifiers.
7. Magnetrons.
8. Comparison of microwave tubes.
9. Microwave transistors.
10. Varactor multipliers.
11. Avalanche Diodes.
12. Transferred electron devices.
13. PIN and varactor diodes.
14. Low noise receivers.
15. Ferrites.
16. Microwave integrated circuits.

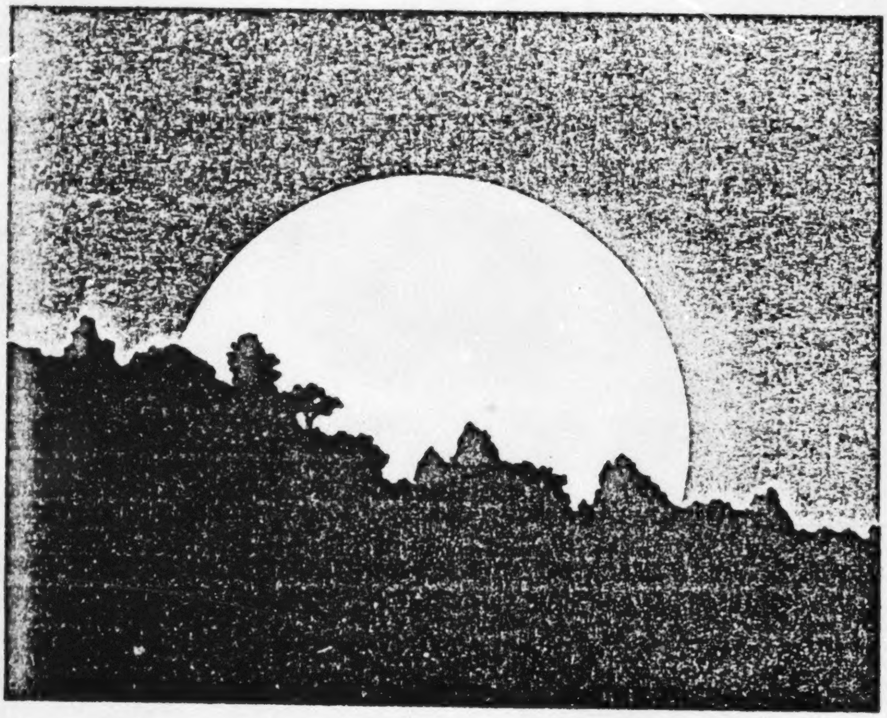
Instructor

The course is taught by Allan W. Scott. Mr. Scott is Manager of Advanced Development for the Microwave Tube division of Varian. He joined Varian in 1967 with a broad professional background that included affiliation with the Bell Telephone Laboratories, the Navy, the Hughes Aircraft Company, Sylvania, and the Microwave Electronics Corp. Mr. Scott is the holder of several significant microwave device patents, the author of numerous technical articles and books, and is a Senior Member of the IEEE. He holds a BS degree in physics from Stanford University and an MS in physics from the California Institute of Technology.

ENGINEERING RENEWAL & GROWTH

College of Engineering
Colorado State University
Fort Collins

Example 4-2



97

4-29a

Michael Athans
Professor of Electrical Engineering
M.I.T.
Director, Electronic Systems
Laboratory

MODERN CONTROL THEORY

This series is a graduate-level course in modern control theory which assumes a working knowledge of vectors and matrices and their basic operations: addition, multiplication, scalar products and norms. Previous exposure to the notion of the eigenvalues and eigenvectors of a matrix would be helpful, although these concepts are briefly reviewed when they are first used. The concept of a transfer function is used for the continuous-time systems. To use the computer subroutines, an elementary knowledge of FORTRAN is sufficient.

The material presented deals with both continuous-time dynamic systems and discrete-time dynamic systems. Continuous-time systems represent the natural description of the majority of physical systems. Discrete-time systems are most often used in the description of socio-economic systems; however, discrete-time systems also arise due to sampling of continuous-time systems (sample data systems). This way of representing physical systems is extremely important because of the rising trend in the use of digital hardware for implementing control systems. The concepts of modern control theory are equally well developed for both continuous-time and discrete-time systems. For this reason, equal attention is paid to both.

Part I: System Analysis

System Analysis introduces the basic ideas required for understanding the state-variable representation and its relationship to the more traditional transfer-function representation.

Eleven 40-minute lectures, study guide, computer manual and text (*Optimal Control,* Athans and Falb, McGraw-Hill, 1966).

Part II: Deterministic Optimal Control

Deterministic Optimal Control presents the basic theoretical tools (continuous and discrete maximum principle) and two popular computational algorithms (the steepest descent method and Newton's method) which are available for solving deterministic dynamic optimization problems for nonlinear dynamical systems with realistic performance criteria.

Nine 40-minute lectures, study guide and text (*Optimal Control,* Athans and Falb, McGraw-Hill, 1966).

Part III: Deterministic Optimal Linear Feedback

Deterministic Optimal Linear Feedback specializes the general results of Part II to the very important class of so-called linear-quadratic problems. Basically, it contains a complete theoretical and algorithmic framework for designing deterministic linear feedback control systems when the system

M.I.T PRODUCED COURSE OFFERED BY COLORADO STATE UNIVERSITY

ILLS REFURBISHMENT

RODUCTION TO CALCULUS

This course is intended for individuals desiring to acquire proficiency in erential and integral calculus at a time and place of their own choosing. The ures, together with the many solved problems in the workbook and text, mit independent self-paced study with little or no need for recourse to an ructor. However, participation in a small study group provides for raction with others and enhances adherence to a regular viewing edule, which experience in continuing education shows are conducive to ly course completion as well as satisfaction with the time and effort ended. Topics include: brief review of exponents, exponential functions; arithms, linear and quadratic equations; derivations of elementary ctions; application of the derivative to find maxima and minima of a given ction; sequences and series; basic rules of integration.

Nineteen one-hour lectures, 200-page study guide and text (*First Year ege Mathematics*, Frank Ayers, Jr., Schaum's Outline Series, McGraw- 1958).

h H. Niemann
essor of Mathematics,
Faculty Adviser

Produced by the
Association for Continuing
Education (ACE)

Ronald Woolley
Assistant Professor of
Mechanical Engineering,
Brigham Young University.

ILLS SUPPLEMENT

INEERING ECONOMY

This course provides a thorough understanding of the concepts and odologies necessary to evaluate the impacts of interest rates, income s, and timing of cash flows on the economic attractiveness of investment posals—whether corporate or personal. It is an excellent preparation for engineering economy section of the Professional Engineers Examination. ics include: the time value of money concept; break-even analysis; orm annual cash-flow, present-worth, rate-of-return, benefit/cost and -effective methods of evaluation; effects of income taxes; replacement siderations; and sources of funds. Mathematics is limited to simple metic.

Ten 25-minute lectures, 250-page study guide and optional text *nciples of Engineering Economy*, Eugene L. Grant, W. Grant Ireson, and ard S. Leavenworth (6th Ed.), Ronald Press, 1976).

FUNDAMENTALS OF VACUUM TECHNOLOGY

Science, engineering, pharmacy and many other classical disciplines use vacuum technology, but no discipline has claimed the field as its own and accepted the responsibility for formal training or education. This course is designed to provide some degree of formal instruction; to provide a systematic, logical learning experience on the fundamentals of the field. The concepts and terminology of vacuum systems are introduced, and the basic principles of ideal gas behavior are discussed. The course then deals with the operating principles and characteristics of vacuum pumps and gauges, from vane pumps and thermal conductivity gauges to titanium sublimation or getter ion pumps and cold cathode or radioactive gauges.

Twenty 15-minute lectures, 450-page study guide and text (*Vacuum Technology*, Andrew Guthrie, John Wiley & Sons, 1963).

Robert M. Anderson, Jr.
Associate Professor of
Electrical Engineering,
Purdue University

Paul J. Wilbur
Associate Professor of
Mechanical Engineering,
CSU Faculty Adviser

MANUFACTURING QUALITY CONTROL

This course provides a thorough understanding of the concepts and methodologies of manufacturing quality control. Topics include: control charts for mean, range and defectives; attribute, variable and continuous sampling plans; vendor certification and rating plans; specifications and tolerances; and product liability. Details are presented on Military Standards 105D, 414 and 1235.

Ten 30-minute lectures, 150-page study guide and text (*Statistical quality Control*, Eugene L. Grant and Richard S. Leavenworth, McGraw-Hill, 1972).

Sanford B. Thayer
Associate Professor of
Mechanical Engineering,
Lecturer and
CSU Faculty Adviser

Part 5: MANAGEMENT PLAN

A. OBJECTIVES

AMCEE intends to install a satellite distribution service according to an established schedule and within a budget which will be agreed upon by the National Institute of Education (N.I.E.) and AMCEE. Management of the contract will follow the Project Framework system defined by the Technology Applications Division of the N.I.E.

B. PROJECT ORGANIZATION

The organization necessary for accomplishment of this project will be kept simple and straightforward. As host institution and fiscal agent for AMCEE, Georgia Institute of Technology will serve as prime contractor. Financial and contractual matters will be handled by the Georgia Tech Office of Contract Administration. Operational management of the project will rest with the AMCEE twelve member Board of Directors. A Satellite Steering Committee, made up of five directors, has been established as a subcommittee to develop and oversee the project from the proposal to operational stage. The Executive Director of AMCEE also sits as a member of the Satellite Steering Committee.

Upon receipt of a contract, a Satellite Project Executive Director will be hired to build the organization necessary to design, install and operate a satellite service. A subcontract with Stanford University will be written to cover the expenses of the chairman of the Steering Committee and the cost of operating the satellite service headquarters at Stanford. Included in the subcontract will be reimbursement for the salary of the Project Executive Director, staff, office, travel, etc. Separate subcontracts will be written with Colorado State University, M.I.T., University of Michigan and the University of Southern California for the services of the other Steering Committee members, and with all universities for use of technical staff.

Georgia Institute of Technology will also enter into a subcontract with EDUTEL Communications and Development, Inc., for the engineering, system design, procurement, installation and testing of the earth terminal network. EDUTEL is a communications and engineering consulting firm with extensive experience in the design and engineering of earth stations as well as in the educational and public service applications of telecommunications systems. The company and its personnel are discussed in detail in Part 6, Personnel.

EDUTEL engineers will perform the system design, engineering, and procurement of hardward for the network. Through a second tier of subcontracts, a frequency coordination firm such as Compucon or Comsearch will be retained to perform the calculations and measurements and submit the applications necessary to accomplish FCC clearance of sites. A similar contracting method will be used to perform the mechanical design and layout of each terminal. A subcontract will be written with a single equipment supplier for the delivery and installation of the entire earth terminal system, where possible.

Figure 5-1 is a block diagram of the various organizational arrangements which have been established to handle this project.

C. PROJECT PLAN

The system design and engineering functions will involve much of the same sort of work accomplished for this planning document, except that it

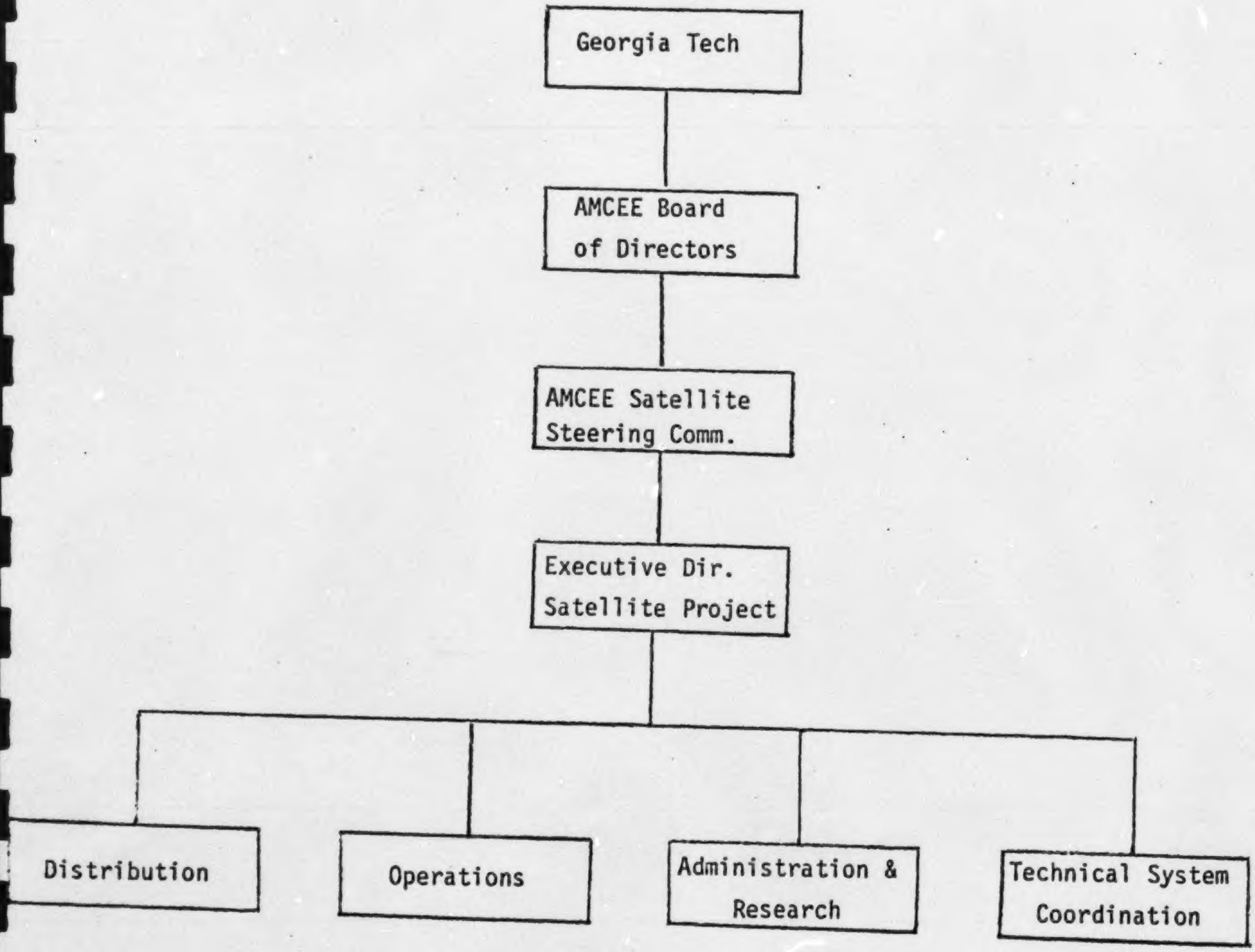

Georgia Tech
AMCEE Board of Directors
AMCEE Satellite Steering Comm.
Executive Dir. Satellite Project
Distribution
Operations
Administration & Research
Technical System Coordination

Figure 5-1. AMCEE Satellite Project Organization Chart

will be performed in more detail and will use then-current information and data. System design will include a reinvestigation of frequency bands, shared system interfaces, and system requirements. Link calculations will be performed, and from those results, detailed equipment specifications will be written. The procurement operation will then begin by obtaining vendor bids on the various equipment specifications and placing purchase orders for the selected equipment.

As soon as equipment and system specifications are complete, site planning and frequency coordination will begin. Site planning will consist of two visits to each AMCEE earth station location. Prior to the first visit, the local AMCEE representative will have made a preliminary selection of at least two site locations that are legally available and close to the Control Center, and will have obtained legal descriptions or maps of the area. The first visit by the engineering team will then coordinate such matters as orbital arc visibility from each site, site availability and suitability, zoning or building code requirements. In addition, sign-off authority will be designated for the various drawings and documents required for site location. Once these matters are defined, the site will be visited by the frequency clearance and coordination subcontractor with equipment to make measurements of radio-frequency interference (RFI) at the site. When a suitable site has been identified and has passed the RFI measurements, the site design team will visit. At this time, drawings will be prepared for antenna foundations and mounting, cable routing, equipment placement, and power interfaces. These drawings will be signed off and approved before the design team leaves the site. The local AMCEE representative will be responsible for obtaining building permits, zoning variances, and soil tests.

In the case of the terminals shared with NPR, the site location and frequency coordination will already be accomplished. The design team will be mainly concerned with equipment placement and interfaces, and the signal routing to the AMCEE studio.

Much of the site planning and layout activity will take place during the lead time required for equipment delivery. In the case of the independent transmit/receive terminals, a subcontract will probably be written with a single prime supplier to deliver and install and test the entire terminal. This may be done with the shared terminals also, but because of the smaller amount of equipment, these terminals may be handled separately. In all cases, EDUTEL engineers and local station engineers will monitor the installation and witness or perform the acceptance testing. Testing will consist of signal-to-noise ratio measurements and other tests which will assure that the equipment is interfaced properly and working as designed. Equipment which is purchased separately will be acceptance tested at the vendor's plant before shipment. The objective of these activities is a properly operating satellite earth terminal being made available to the AMCEE school.

The PERT chart of Figure 5-2 shows the various activities discussed here and their relationships to one another. The numbers in the circles indicate the most optimistic time, most likely time, and most pessimistic time of performance for each event. From these estimates the expected time is calculated and the critical path for the project determined. The critical path for the project is the system design and procurement path, followed closely by the frequency coordination and site clearance path. These activities mesh rather well in time at the equipment installation and integration event some 230 days after go-ahead. The entire design

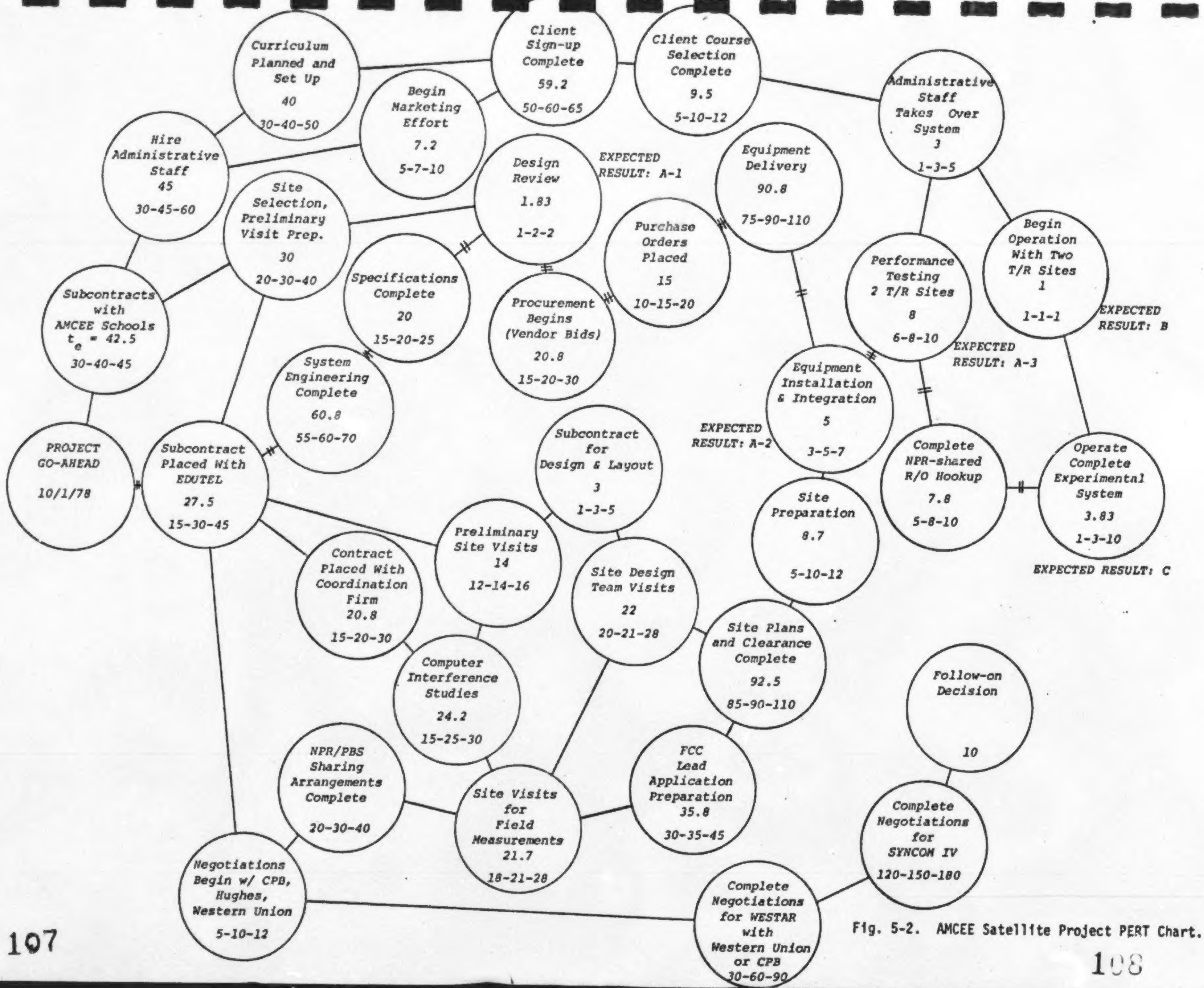

Curriculum Planned and Set Up
40
30-40-50
Client Sign-up Complete
59.2
50-60-65
Client Course Selection Complete
9.5
5-10-12
Administrative Staff Takes Over System
3
1-3-5
Hire Administrative Staff
45
30-45-60
Begin Marketing Effort
7.2
5-7-10
Design Review
1.83
1-2-2
EXPECTED RESULT: A-1
Equipment Delivery
90.8
75-90-110
Site Selection, Preliminary Visit Prep.
30
20-30-40
Purchase Orders Placed
15
10-15-20
Performance Testing 2 T/R Sites
8
6-8-10
Begin Operation With Two T/R Sites
1
1-1-1
EXPECTED RESULT: B
Subcontracts with AMCEE Schools
t_e = 42.5
30-40-45
Specifications Complete
20
15-20-25
Procurement Begins (Vendor Bids)
20.8
15-20-30
EXPECTED RESULT: A-3
Equipment Installation & Integration
5
3-5-7
System Engineering Complete
60.8
55-60-70
EXPECTED RESULT: A-2
PROJECT GO-AHEAD
10/1/78
Subcontract Placed With EDUTEL
27.5
15-30-45
Subcontract for Design & Layout
3
1-3-5
Complete NPR-shared R/O Hookup
7.8
5-8-10
Operate Complete Experimental System
3.83
1-3-10
EXPECTED RESULT: C
Site Preparation
8.7
5-10-12
Preliminary Site Visits
14
12-14-16
Contract Placed With Coordination Firm
20.8
15-20-30
Site Design Team Visits
22
20-21-28
Site Plans and Clearance Complete
92.5
85-90-110
Computer Interference Studies
24.2
15-25-30
Follow-on Decision
10
NPR/PBS Sharing Arrangements Complete
20-30-40
Site Visits for Field Measurements
21.7
18-21-28
FCC Lead Application Preparation
35.8
30-35-45
Complete Negotiations for SYNCOM IV
120-150-180
Negotiations Begin w/ CPB, Hughes, Western Union
5-10-12
Complete Negotiations for WESTAR with Western Union or CPB
30-60-90

Fig. 5-2. AMCEE Satellite Project PERT Chart.

and installation phase of the pilot project will take about nine months for completion. The worst-case situation, i.e., where all the most pessimistic times are required, is about 340 days, or a little over 11 months. The critical path is identified by the double hash marks on the lines connecting events on the PERT chart. The events on the PERT chart will be essentially repeated for the second and third years of the project.

The milestone chart of Figure 5-3 shows the time-phasing and expected elapsed times for the various project activities in the experimental project. These charts, plus graphs showing funds commitment as a function of time, will be used for overall management and control of the project. Additional discussion of higher level project control and the accompanying PERT charts will be found in Section D of Part 5.

D. PROJECT CONTROL AND EVALUATION

The project is designed to be managed under the program management concept where a program manager will be assigned and given complete control of both the budget and technical matters. The overall program manager will be a member or appointee of the AMCEE Board of Directors. This person will be assisted in technical matters by a Project Engineer assigned to the project by EDUTEL Communications & Development, Inc.

The Program Manager and the Project Engineer will make use of documents such as the PERT chart of Figure 5-2 for close monitoring of technical progress and accomplishment of key events. In addition, a milestone chart in conjunction with a fiscal control chart will be used to monitor expenditure trends against milestone accomplishment. An example of such a chart is shown in Figure 5-4. By plotting expected expenditures in both labor and materials against technical milestones, the entire project may be laid

Figure 5-3

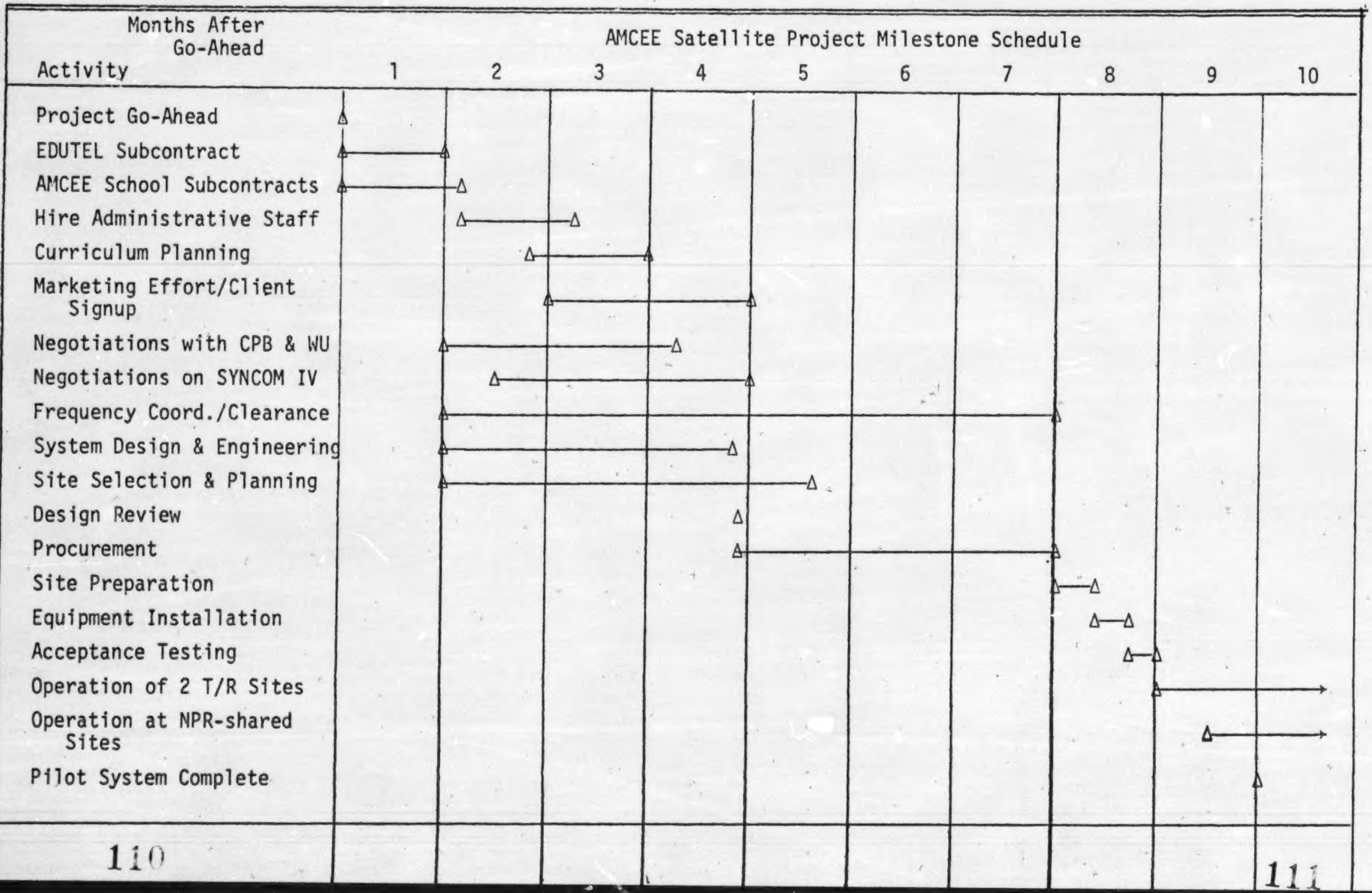

Months After Go-Ahead
AMCEE Satellite Project Milestone Schedule
Activity
1
2
3
4
5
6
7
8
9
10
Project Go-Ahead
EDUTEL Subcontract
AMCEE School Subcontracts
Hire Administrative Staff
Curriculum Planning
Marketing Effort/Client Signup
Negotiations with CPB & WU
Negotiations on SYNCOM IV
Frequency Coord./Clearance
System Design & Engineering
Site Selection & Planning
Design Review
Procurement
Site Preparation
Equipment Installation
Acceptance Testing
Operation of 2 T/R Sites
Operation at NPR-shared Sites
Pilot System Complete

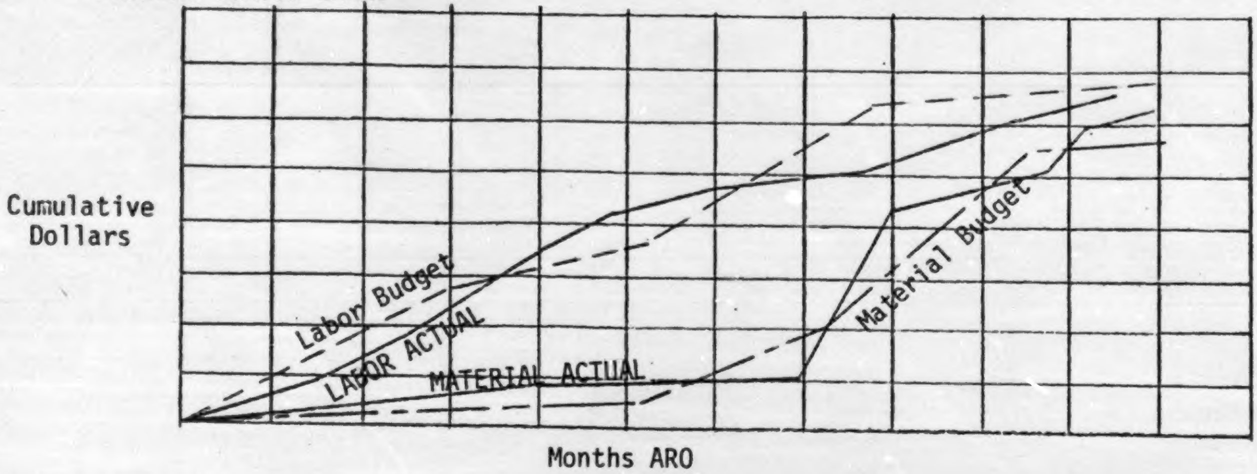
Fig. 5-4

PROJECT STATUS CHART

Project Mgr. ______________________

Job No. __________

Date __________



Cumulative	Labor												
	Materials												
	TOTAL												
Monthly	Labor												
	Materials												
	TOTAL												

Labor Budget (Hours)	Task												
Milestones	Task												

out in terms of expenditures versus time. As actual funds commitments occur, they are plotted on a weekly basis against the projected trends. Naturally, MIS data processing and accounting techniques are used to provide the inputs for these charts, but no technique shows visually the trends that are developing in expenditure versus time as well as plots of this type. Once a trend away from projected expenditures by more than 10% is noted, management can take action to learn the cause and correct it.

The PERT chart of Figure 5-2 also shows the Expected Results points throughout the project. This PERT chart may be used with the charts of Figure 5-5 and 5-6 to form the nested network of control points for three levels of management. The detailed chart of Figure 5-2 covers a year's activity and is used for the second and third years of activity by returning to the go-ahead point since most key events are repeated.

In terms of the accomplishment of Expected Results and Project Objectives, the Expected Results are couched in terms of the number and locations of new clients served by AMCEE, the number of catalog course offerings, and by the earth stations coming on line. These results will grow in numbers during the first three years of the project as the system grows. The projected numbers of these identifiable results are shown in Table 4-1 of Part 4-G, Marketing Plan AMCEE Services.

Table 5-1 shows the Project Framework wherein the Project Goals, Objectives and Expected Results are given. The Verifiable Indicators and the Means of Verification are given along with the important assumptions affecting each goal, objective or result. Expected Results from Table 5-1 are also indicated on the PERT charts of Figures 5-2, 5-5, and 5-6, as A-1, A-2, B-1, etc., since the Expected Results may have more than one Verifiable Indicator. More discussion on some of the assumptions and alternatives is provided in Part 5-E.

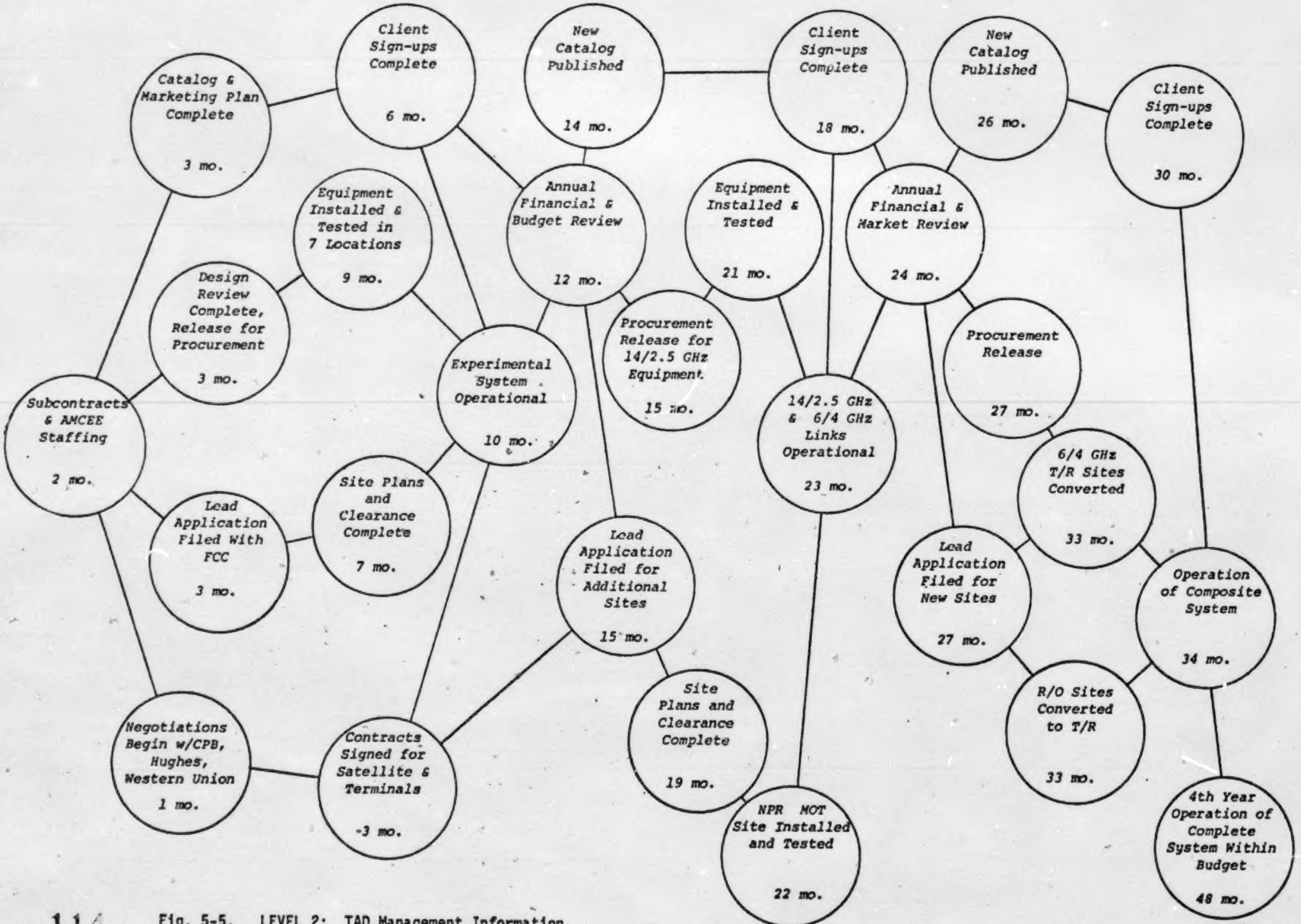

Catalog & Marketing Plan Complete 3 mo.
Client Sign-ups Complete 6 mo.
New Catalog Published 14 mo.
Client Sign-ups Complete 18 mo.
New Catalog Published 26 mo.
Client Sign-ups Complete 30 mo.
Equipment Installed & Tested in 7 Locations 9 mo.
Annual Financial & Budget Review 12 mo.
Equipment Installed & Tested 21 mo.
Annual Financial & Market Review 24 mo.
Design Review Complete, Release for Procurement 3 mo.
Experimental System Operational 10 mo.
Procurement Release for 14/2.5 GHz Equipment 15 mo.
Procurement Release 27 mo.
Subcontracts & AMCEE Staffing 2 mo.
14/2.5 GHz & 6/4 GHz Links Operational 23 mo.
6/4 GHz T/R Sites Converted 33 mo.
Lead Application Filed With FCC 3 mo.
Site Plans and Clearance Complete 7 mo.
Lead Application Filed for Additional Sites 15 mo.
Lead Application Filed for New Sites 27 mo.
Operation of Composite System 34 mo.
Negotiations Begin w/CPB, Hughes, Western Union 1 mo.
Contracts Signed for Satellite & Terminals -3 mo.
Site Plans and Clearance Complete 19 mo.
R/O Sites Converted to T/R 33 mo.
NPR MOT Site Installed and Tested 22 mo.
4th Year Operation of Complete System Within Budget 48 mo.

Fig. 5-5. LEVEL 2: TAD Management Information.

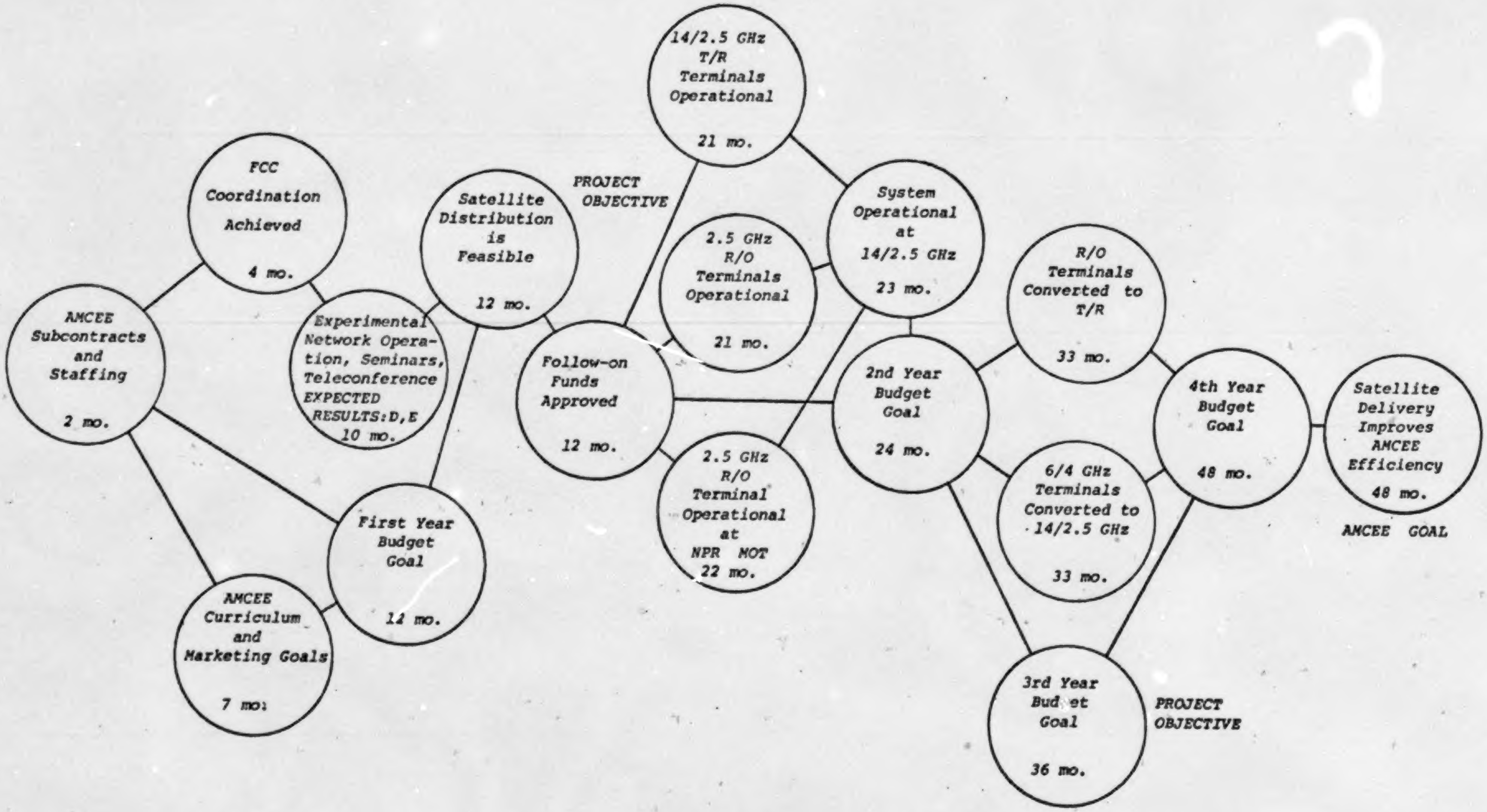

AMCEE Subcontracts and Staffing 2 mo.
FCC Coordination Achieved 4 mo.
AMCEE Curriculum and Marketing Goals 7 mo.
Experimental Network Operation, Seminars, Teleconference EXPECTED RESULTS: D, E 10 mo.
First Year Budget Goal 12 mo.
Satellite Distribution is Feasible 12 mo.
PROJECT OBJECTIVE
Follow-on Funds Approved 12 mo.
14/2.5 GHz T/R Terminals Operational 21 mo.
2.5 GHz R/O Terminals Operational 21 mo.
2.5 GHz R/O Terminal Operational at NPR MOT 22 mo.
System Operational at 14/2.5 GHz 23 mo.
2nd Year Budget Goal 24 mo.
R/O Terminals Converted to T/R 33 mo.
6/4 GHz Terminals Converted to 14/2.5 GHz 33 mo.
3rd Year Budget Goal 36 mo.
PROJECT OBJECTIVE
4th Year Budget Goal 48 mo.
Satellite Delivery Improves AMCEE Efficiency 48 mo.
AMCEE GOAL

Fig. 5-6. LEVEL 1: N.I.E. Top Management Information.

TABLE 5-1
PROJECT FRAMEWORK

NARRATIVE SUMMARY	VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
PROJECT GOAL:	MEASURES OF GOAL ACHIEVEMENT:		
To determine the extent to which communication satellites enhance AMCEE ability to reach its goal.	1. Course material from each uplink school is delivered to downlink schools and distributed to clients over satellite network.	AMCEE records and independent observation of number of clients and locations receiving course material at end of each year.	Program material is useful to many clients over long term
	2. Course material from uplink locations is available in places not previously served by local ITFS and/or which were previously reached by mail service.	AMCEE records and independent observation.	
PROJECT OBJECTIVE:	CONDITIONS THAT WILL INDICATE PROJECT OBJECTIVE HAS BEEN ACHIEVED:		
To demonstrate the feasibility of a self-sustaining program which provides improved access to continuing education for engineers by establishing and testing on a pilot basis a satellite-based video distribution and conference network.	1. Project meets its marketing goals for each year. Client signups indicate recipients not previously participating.	AMCEE records indicate number and location of clients signed up. AMCEE catalog shows number of courses offered.	Overall price is attractive to clients. Economic climate favorable. Schools offer projected number and type of attractive courses. Producer and distributor can meet expenses at price.
	2. Project meets or exceeds its projected operating budget each year.	AMCEE annual financial report. Satellite use contract on file.	Interconnection and/or satellite use costs are close to projections.
	3. Pilot satellite network is installed, tested and operated.	Earth stations are accepted for operation, or experimental link is operated.	FCC Clearance granted. CPB/NPR/PBS sharing contract is signed. Project go-ahead is on time. Satellite is available.
EXPECTED RESULTS:	MEASURES OF GOAL ACHIEVEMENT:		
A. Design, installation and test of earth stations to implement three service delivery models: distributor, direct service, and combination.	1. Design Review approval indicates system design in sound.	Release for procurement.	Satellite availability. FCC clearance outlook is positive.
	2. Earth station sites are selected and interference situation known.	Lead application filed with FCC.	Subcontractor meets schedule. Affected parties cooperate.
	3. Equipment is installed and tested at earth stations.	Acceptance test signoff.	Equipment vendors meet schedules.
	4. Real time signal from uplink school is available through a receive-distributor location.	AMCEE records. Independent observation of classroom reception.	Distributor can meet expenses with set price. Distribution means available.
	5. Real time signal from uplink school is available at a receiving school or industrial location through a shared earth station arrangement.	Contract with CPB is on file. Independent observation of classroom reception.	CPB/NPR/PBS agrees to share earth stations. Interconnection expense and regulations not prohibitive.

TABLE 5-1 (continued)

NARRATIVE SUMMARY	VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
	6. A direct service model is in operation at an industrial location.	Company installs terminal. Independent observation of classroom reception.	Company sees economic worth. FCC Regulations can be met.
B. Delivery of regular classroom subject material beyond present regional boundaries served by ITFS or mail service.	1. Real time signal of two uplink schools available at a location not now receiving local ITFS and available only by mail service.	Acceptance of two Transmit/Receive terminals for operation or independent observation of received signal at downlink.	FCC clearance granted. Satellite available. CPB agrees to allow use of earth stations.
C. Delivery of more packaged subjects to larger number of clients on a timely and efficient basis.	1. Real time signal of two uplinks available at six other locations beyond local ITFS and served only by mail.	Acceptance of two Transmit/Receive terminals or written agreement with earth station owner for use of terminals. Acceptance for operation of five shared downlinks or agreement for use.	FCC clearance granted. Satellite available. CPB agrees to share or allow use of terminals.
	2. Forty videotaped courses or instructional programs available at six locations. Publishers inventory reduced.	AMCEE records. Sales reports. AMCEE catalog. Independent observation.	Course material and price attractive to clients.
D. Delivery of novel special program not now broadcast or videotaped for national distribution because of financial constraints imposed by small local audience.	One special joint program or teleconference or seminar or special event is broadcast over satellite network.	AMCEE records. Independent observation of program and audience.	At least two terminals available. Sufficient satellite capacity available.
E. Teleconferences by satellite network to improve AMCEE coordination.	One AMCEE teleconference in place of travel and face-to-face meeting.	Decision on following year catalog offering made on or as a result of teleconference.	Multiple satellite channels available. At least two terminals available.
INPUTS:			
1. Earth Station Network			
a. Contracts signed	Identification of s/c negotiations	Contracts on file	
b. Engineering & design	Design complete; specs. written	Design review; release for procure.	
c. Site selection & plan	Sites selected; layouts complete	Site preparation complete. Site drawings approved.	
d. Procurement	Purchase orders; equip. on order	Accepted P.O.s; equipment delivery.	
e. FCC clearances	Lead application filed.	FCC approval notice.	
f. Installation	Equip. installed and integrated	Contractor invoice received.	
g. Acceptance tests	Accept.test procedures/performance	Terminal acceptance signoff.	
h. M/O procedures	Operators trained & functioning	AMCEE takes over operation.	

TABLE 5-1 (continued)

NARRATIVE SUMMARY	VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
2. AMCEE Administrative Staff Functions			
a. Staff personnel	Administrative staff hired.	Organizational chart staffed. Employment contracts.	
b. School contracts	Representative functions identified.	Contracts signed.	School administration agreement.
c. Curriculum plan	AMCEE curriculum set up and catalog designed.	AMCEE catalog published.	
d. Marketing plan	Catalog available, sales tools in operation	Sales/client signups.	Overall economic picture for clients.
e. User involvement	Industrial Advisory Board meets and provides input.	Industrial Advisory Board reports.	Industry participates.
3. Satellite Transponders			
a. Satellite identified	System design studies. Owner contacted.	System design complete. Negotiations begin. Contract signed.	Clearance possible. Satellite available.
b. Earth station sharing	System design studies. Owner contacted.	Written agreements.	Owner is interested and has capacity.

E. ALTERNATIVES AND CONTINGENCIES

In the Project Framework of Table 5-1, a number of important assumptions are listed over which AMCEE or the project proposed here may have no control. It is necessary that some alternatives be in mind in case these assumptions do not materialize. The assumptions which affect the progress of the project and for which there may be alternative courses of action are as follows:

1. The Project Go-Ahead occurs no later than 1 October 1978.

   If project go-ahead is delayed by more than six months, the project will move immediately to equip earth stations with the 14/2.5 GHz equipment, since by the time the equipment is in place and operating SYNCOM IV is expected to be in orbit. (Spring of 1980)

2. The FCC will grant an experimental clearance for 4.5-meter antennas to be used as 6 GHz video uplinks.

   If the FCC will not allow the installation of 4.5-meter antennas as temporary uplinks at 6 GHz, we will seek an agreement with PBS/CPB to allow AMCEE to rent time on the PBS uplinks at WLTR, Columbia, South Carolina (University of South Carolina) and possibly KRMA at Denver, Colorado. AMCEE members will ship tapes to the PBS uplink sites according to an agreed upon schedule for the first year of operation.

3. SYNCOM IV will be available in orbit by Spring of 1980.

   If SYNCOM IF is not launched, AMCEE will proceed to design and install earth terminal equipment to operate at 14/12 GHz and will seek to lease time on the SBS or other 14/12 GHz satellites.

   A second alternative may be to continue and enlarge the operation at 6/4 GHz if FCC clearance is accomplished.

4. CPB/PBS/NPR will allow AMCEE to share their earth stations or satellite.

   If CPB/PBS/NPR will not share their equipment, AMCEE will solicit an agreement with a common carrier such as RCA/Home Box Office to allow experimental transmission of course material. However, CPB is presently conducting a study on ways of sharing their equipment in public service and educational applications, so this assumption is highly justified.

Part 6: PERSONNEL

A. AMCEE

The project will be coordinated for the prime contractor, Georgia Institute of Technology, by AMCEE Executive Director, William J. Lnenicka (10% time). Responsible to AMCEE for overall operational management of the project will be the Satellite Steering Committee Chairman, Kenneth S. Down, Assistant Dean, School of Engineering at Stanford University(20% time).

Mr. Down has nearly ten years experience in managing a four channel ITFS network which serves some 50 San Francisco Peninsula companies. He has also manages the Tutored Videotape Instruction program for Stanford. Experience in working with satellites includes a six month curriculum sharing experiment between Stanford and Carleton University in Ottawa, and operating a two day teleconference between the University of Montreal and Stanford.

David L. Green is proposed as Executive Director of the project (50% time). He will be assisted by a full-time administrator and secretary. Mr. Green is ideally suited to assume responsibility for this project. His experience in both cable and non-profit educational television system management coupled with the many experimental satellite projects which he has managed make him a unique individual. His academic background in business administration provides him the necessary technical tools essential to running a project of the magnitude proposed.

Steering Committee members will serve at 6% time each, probably meeting on a quarterly basis.

Resumes of key individuals and summaries of Steering Committee members follow. Also included is a summary of papers, reports, etc. of AMCEE members.

DAVID L. GREEN
109 Hillcrest Road
Berkeley, CA 94705
Telephone: (415) 652-5697

Born 7/5/44
Married, 2 sons
U.S. Citizen

OBJECTIVE: Development of Telecommunications Systems and Organizations

EDUCATION: COLUMBIA UNIVERSITY - Graduate School of Business
Master of Business Administration, 1971

OREGON COLLEGE, Monmouth, Oregon
Bachelor of Science - Liberal Arts, 1969

WORK EXPERIENCE: EDUCATIONAL TELEVISION CENTER, Menlo Park, CA

7/76 - present Station Manager/Principal Investigator, Communications Technology Satellite (CTS) Experiment #16 (Project Interchange)

- joint appointment which includes, in addition to duties of Station Manager as described below, Principal Investigator responsibilities, particularly to National Aeronautics & Space Administration (NASA), for coordination and evaluation of CTS staff development experiment in education.
- responsible for design and operation of project; liaison with local NASA facility, coordination with other CTS Experimenters including Veterans Administration, National Library of Medicine, Public Service Satellite Consortium.
- provide assistance to short term CTS demonstrators in satellite teleconferencing including U.S. Conference of Mayors, National Institute on Drug Abuse, DHEW/Region IX, Ontario Educational Communications Authority, Governor's Office.

Personal Involvement:
Vice Chairman, Instructional Advisory Committee, California Public Broadcasting Commission. Co-founder and President, Columbia Business School Alumni Assoc. of Northern California. Consultant in Telecommunications; Public Service Satellite Consortium, Association of Western Hospitals, and others.

Publications / Reports:
- Project Interchange, A CTS Teacher Teleconferencing Experiment; A Report on Work in Progress, Presentation to HERMES Symposium, Ottawa, November 1977.
- Project Interchange, A CTS Teacher Teleconferencing Experiment; Educational and Industrial Television, November 1977.

Satellite Demonstrations:
- "Readalong Goes Satellite," for Ontario Educational Communications Authority (Toronto), via CTS, January 1978.
- "Satellite Arts," 3 day exploration of creative applications of satellite technology, funded by NEA & CPB, via CTS, November 1977.
- "Satellite Town Hall," on National Health Insurance, for the Department of Health, Education and Welfare, Region IX, via CTS, October 1977.

Satellite Demonstrations (continued):

- "Youth SatCon 77," on Drug Abuse Prevention, for the National Institute on Drug Abuse, via CTS, October 1977.
- "Teleconference with Governor Brown," on Technology in Education, via CTS, August 1977.
- "Telecommunications and Special Education," for the University of Kentucky, (Conference on Satellites and Special Education), via CTS, June 1977.
- "The Mayors Teleconference," for the U.S. Conference of Mayors, with Patricia Harris, Secretary of HUD, via CTS, March 1977.

10/75 - 7/76 Station Manager

- responsible for development and implementation of $250,000 operating and capital budget; responsible for revenues and expenditures.
- supervise engineering, programming, production and operations departments.

3/75 - 9/75 Assistant Station Manager

- responsible to Station Manager for day-to-day operation of the ETV Center. Prepared annual budget, supervised department heads and functioned as head of Engineering Department with responsibility for performance of operations, transmitters, maintenance, and field service.

9/73 - 3/75 Director, Special Projects

- responsible to Station Manager for development and management of special projects.

2/72 - 9/73 ATHENA COMMUNICATIONS (Bay Cablevision), Berkeley, CA

Director, Local Origination

- responsible for overall operation of 5 channels serving two franchises; designed studio facility, assisted in installation and operated all equipment; developed community oriented local origination programming; built times sales.
- established first Public Access channel on West Coast. Addressed Spring and Fall ('72) Conventions of the California Community Television Association (CCTA) on the subject. Served on Cablecasting Committee of CCTA.
- called together Cablecasters from throughout Northern California to form Northern California Cablecasters Association (NCCA) as the first step in regional networking of CATV systems.
- personally featured on cover of CATV Newsweekly, and in feature pieces in New York Times, Sunday Chronicle/Examiner.

10/71 - 2/72 TELEPROMPTER CORPORATION, Santa Monica, CA

Program Director

- 10,000-plus subscriber system; responsible for programming, production, time sales, engineering, administration, community and governmental relations.

4/71 - 10/71 Ukiah, California

Management Development Program; all phases of CATV operation.

KENNETH S. DOWN
Assistant Dean and Director
Stanford Instructional Television Network
School of Engineering, Stanford University

EDUCATION

Stanford University, A.B., 1960
University of Santa Clara, M.B.A., 1971

UNIVERSITY ADMINISTRATIVE EXPERIENCE

Director, Stanford Instructional Television Network, 1969 to present

PROFESSIONAL ACTIVITIES

National Association of Education Broadcasters: Steering Committee for Instructional Television Fixed Service, 1974-5.

Association for Media-based Continuing Education for Engineers (AMCEE), Vice-Chairman, Board of Directors, 1976-present.

Consultant to M.I.T., U.S.C., Genesys Systems, Inc.

Panelist, NASA Workshop on a public service communications satellite system, 1977.

Referee, I.E.E.E. Transactions on Education, 1976 - present.

Manager, Satellite-based curriculum sharing experiment between Carleton University, Ottawa, and Stanford University, 1976-77.

Co-Chairman (with E. Parker), International Teleconference on Social Uses of Satellites: Montreal and Stanford, June 1977.

CONFERENCE PROCEEDINGS

(With L.V. Baldwin) A Proposed Plan of Action for Continuing Education Studies. ASEE 1976 College Industry Education Conference Proceedings, 393 (January 1976).

(With D. Lumb, M. Sites) University Resources Sharing Using the Communications Technology Satellite. Conference Record, 1976 IEEE International Conference on Communications, 1-23 (June 1973).

Advanced Courses and Continuing Education on Microelectronics via Television: Stanford University and the Association for Media-based Continuing Education for Engineers (AMCEE). The Second IEEE (G-PHP)/ISHM University/Industry/Government Microelectronics Symposium (January 1977).

JOURNAL PUBLICATIONS

The Stanford Instructional TV Network: A Survey of Its Students. Engineering Education, 762 (April 1976).

(With J.F. Gibbons, W.R. Kincheloe) Tutored Videotape Instruction: A New Use of Electronics Media in Education. Science 195, 1139 (1977).

WILLIAM JOSEPH LNENICKA

Professor of Engineering Science & Mechanics
Georgia Institute of Technology

EDUCATION

University of Nebraska	B.S. (CE), 1949
Kansas State University	M.S. (CE), 1953
Georgia Institute of Technology	Ph.D., 1961

PROFESSIONAL REGISTRATION

Registered Professional Engineer, Oklahoma, Kansas, Georgia

UNIVERSITY ADMINISTRATIVE EXPERIENCE

1977-date Assistant (for Media-Based Instruction) to the Vice President for Academic Affairs.

UNIVERSITY FACULTY EXPERIENCE

1968 - date	Professor, Engineering Science & Mechanics
1961 - 1968	Associate Professor, Engineering Mechanics, Georgia Institute of Technology
1958 - 1961	Assistant Professor, Civil Engineering, Georgia Institute of Technology
1957 - 1958	Assistant Professor, Engineering Mechanics, Louisiana State University
1954 - 1957	Assistant Professor, Engineering Mechanics, University of Oklahoma
1952 - 1954	Instructor, Civil Engineering, Kansas State University
1949 - 1951	Instructor, Civil Engineering, University of Nebraska

OTHER PROFESSIONAL EMPLOYMENT

Summer 1975	Associate Engineer, Wilroy & Associates, Consulting Engineers
Summer 1971	Chief Engineer, Plant Construction, Vinings Chemical Company
Summer 1968	Chief Engineer, Plant Construction, Vinings Chemical Company
Summer 1963	Structures Engineer, Senior, Lockheed-Georgia Aircraft Corporation
Summer 1962	Structures Engineer, Senior, Lockheed-Georgia Aircraft Corporation
1951 - 1952	Maintenance Engineer, Proctor and Gamble Manufacturing Company
Summer 1949	Bridge Engineer, Nebraska State Highway Department

CONSULTING EXPERIENCE

1954 - 1962	Chief Design Engineer, Aerial Tower Manufacturing Company
1971 - Present	Consulting Engineer, Wilroy & Associates

RESEARCH EXPERIENCE

Through the years, research activities have been carried out on the effect of additives to concrete, the optimum configuration of guyed towers, and in the use of media and programmed instruction in engineering education.

MILITARY EXPERIENCE

Enlisted United States Army Reserve as Private, Infantry, 1942. Present rank Colonel, Corps of Engineers, United States Army Reserve. Current assignment, Assistant for Construction, South Atlantic Division, Corps of Engineers. Graduate, Associate Course, Command and General Staff College.

PROFESSIONAL SOCIETY MEMBERSHIPS AND ACTIVITIES

Society of American Military Engineers; National Society of Professional Engineers; Georgia Society of Professional Engineers; American Society for Engineering Education; member executive committee, Mechanics Division, National ASEE (1973-77); member executive committee, Mechanics Division, Southeastern Section ASEE (1973-77), Secretary (1974-75), Vice-Chairman (1975-76), Chairman (1976-77); Instructional Unit, Southeastern Section, ASEE, Secretary (1975-76), Vice-Chairman (1976-77); Committee on Curricular Emphasis in Basic Mechanics, National ASEE, Secretary (1975 - . . .).

HONORS AND AWARDS

Blue Key; Sigma Tau; Sigma Xi; Phi Kappa Phi; Who's Who in Engineering; Who's Who in South and Southwest

OTHER ACTIVITIES

Georgia Tech representative to Educational Media Institute, University of Georgia, (1968-69); Program Chairman, Effective Teaching Institutes, Georgia Institute of Technology, April 1968, February 1969, May 1970; Co-founder, treasurer and member, Board of Directors, Vinings Chemical Company (1964-1973); member Board of Directors, Vinings Leasing Company (1968-73); Secretary, Second Conference on Theoretical and Applied Mechanics

PUBLICATIONS

Book

Programmed Instruction In Statics, Lnenicka, Bernard, Stoneking, Page Publishing Co., 1974

Publications

1. "Programmed Instruction - Project 1000," Proceedings of 1973 Conference on Frontiers In Education, IEEE, April 1973, pp. 149-152 (with M.C. Bernard).

2. "Educational Engineering - Project 1974," Proceedings of the 1974 International Conference on Frontiers in Education, IEEE, London, England, July 1974, pp. 127-130

plus 7 others in various publications since 1970

SATELLITE STEERING COMMITTEE

LIONEL V. BALDWIN - Dean, College of Engineering, Colorado State University. Dr. Baldwin originally developed the plan for the Dallas "Workshop on Continuing Education for Engineers at Midcareer." He has been the driving force behind the formation of AMCEE, and currently serves as Chairman of the Board of Directors. He is regarded as an authority on the subject of using educational technology in engineering education. He has served as a Consultant on Educational Technology, National Institute of Education, 1973; Consultant on Productivity in Education, President's Science Advisory Council, 1971-72; Consultant to Tennessee Higher Education Committee, 1969; Member, National Science Foundation Advisory Committee on Science Education, 1967-70.

JOHN T. FITCH - Director, Technology Based Educational Development and Marketing, Center for Advanced Engineering Study, Massachusetts Institute of Technology. Mr. Fitch has in-depth experience in marketing packaged videotape learning materials world-wide. He has made arrangements with other AMCEE member institutions whereby materials are cross-cataloged and cross-licensed for rental and sale between M.I.T. and other universities. He is viewed as an expert in developing pricing models and in developing and distributing marketing materials.

JACK MUNUSHIAN - Professor of Electrical Engineering and Director, University of Southern California Interactive Instructional Television Network. Dr. Munushian has five years experience in managing an ITFS network. Of particular significance is the fact that he has set up two regional television classrooms to service engineering professionals in the Los Angeles area who, for a variety of reasons, can not take advantage of the traditional in-house television arrangements where they work. Dr. Munushian also has been offering weekly televised previews of potential videotape offerings. This permits training directors, engineering managers, and potential students to obtain a first hand look at possible instructional programs. Support for the regional classrooms and the weekly previews has been provided by the National Science Foundation.

HAL F. SCHULTE, JR. - Director, Instructional Television Systems, College of Engineering, University of Michigan. Mr. Schulte has seven years experience operating the University of Michigan televised engineering program. His background in electrical engineering coupled with his research experience in space studies qualify him to provide insight into the various technical options available in using communications satellites for education.

Following is a list of papers, reports and conference proceedings which demonstrate the capabilities and leadership in the field of instructional television in higher education of the AMCEE membership. These references are either by AMCEE university representatives or about programs conducted at AMCEE member institutions.

________________, Talking Back to the TV, *Mosaic*, Vol. 5, No. 3 (Summer 1974).

Baldwin, L.V., Churchill, R.V., Lord, W., Maxwell, L.M., University, College and Industrial Cooperation in Higher Education, *Electronics & Power* (1970).

Baldwin, L.V., Neidt, C.O., Use of Videotape for Teaching In-Plant Graduate Engineering Courses, *Adult Education*, Vol. XX, No. 3 (1970).

Baldwin, L.V., Collias, A.V., Davis, C.M., Schmaling, G., Workshop on Continuing Education for Engineers at Midcareer, College of Engineering, Colorado State University (August 1974). (Sponsored by National Science Foundation grant GY-11304, Lyle W. Phillips, sponsor representative).

Baldwin, L.V., Creating Educational Opportunities for Engineers with Communication Technologies, prepared for Alfred P. Sloan Foundation (October 1975) (James D. Koerner).

Baldwin, L.V., Down, K.S., A Proposed Plan of Action for Continuing Education Studies. *ASEE 1976 College Industry Education Conference Proceedings* (January 1976).

Davis, C.M., TV Delivery of Continuing Education Programs, *Training & Development Journal* (July 1973).

Down, K.S., The Stanford Instructional TV Network: A Survey of Its Students, *Engineering Education*, 762 (April 1976).

Down, K.S., Lumb, D., Sites, M., University Resources Sharing Using the Communications Technology Satellite, *Conference Record, 1976 IEEE International Conference on Communications*, Vol 1 (June 1976).

Down, K.S., Advanced Courses and Continuing Education on Microelectronics via Television: Stanford University and the Association for Media-based Continuing Education for Engineers (AMCEE), *The Second IEEE (G-PHP)/ISHM University/Industry/Government Microelectronics Symposium* (January 1977).

Gibbons, J.F., Kincheloe, W.R., Down,K.S., Tutored Videotape Instruction: A New Use of Electronics Media In Education, *Science*, 195, 1139 (1977). (This work sponsored by N.I.E. under contract N.I.E - 0038 represented by Lawrence P. Grayson telephone (202)254-6050.

Jamison, Dean T., et al, The Stanford Instructional Television System, Cost Analysis for Educational Planning and Evaluation: Methodology and Application to Instructional Technology, Chapter VIII, Agency for International Development Studies in Educational Technology (January 1976).

Lnenicka, W.J., AMCEE - Past, Present and Future, ASEE 1977 College Industry Education Conference Proceedings (January 1977).

Loomis, H.H., Jr, and Brandt, H., Television as a Tool in Engineering Education, IEEE Transactions on Education, Vol. E-16, No. 2 (May 1973).

Martin-Vegue, C.A., Morris, A.V., Rosenberg, J.M., Tallmadge, G.E., Technical and Economic Factors in University Instructional Systems, Proceedings of IEEE, Vol. 59, No. 6 (June 1971)

Morris, A.J., Down, K.S., Munushian, J., McGhie, L.F., Rubenstein, R., Hike, R.C., Final Report on Cost Effectiveness of Continuing Engineering Studies by Television, Submitted to Continuing Engineering Studies Division, American Society for Engineering Education (May 1974).

Pettit, J.M., Grace, D.J., The Stanford Instructional Television Network, IEEE Spectrum, Vol 7, No. 5 (May 1970).

Rothenberg, D., Continuing Professional Education: Status, Trends, and Issues Related to Electronics Delivery, Center for Development Technology, Washington University, St. Louis, Missouri (August 1975).

Vail, C.R., Bush, S.A., Talkback TV at Southern Methodist University: Four Years of Experience, Proceedings of IEEE, Vol. 59, No. 6 (June 1971).

Wong, M.D., The Role of Technology in Non-Traditional Higher Education, Center for Development Technology, Washington University, St. Louis, Missouri (August 1974).

B. EDUTEL Communications & Development, Inc. PERSONNEL

The technical and procurement parts of the earth station design and installation will be subcontracted to EDUTEL Communications and Development, Inc. EDUTEL will act as systems manager of the satellite project. EDUTEL is a telecommunications consulting firm which is uniquely qualified, both in terms of personnel and of corporate experience to direct an engineering and installation project of this type. EDUTEL personnel will perform the design and engineering tasks, manage the equipment procurement, and direct the installation and testing of the earth terminals. In the case of complete earth terminal procurements, EDUTEL will issue a subcontract with a major equipment supplier for the delivery and installation of the entire terminal.

In the event a contract is awarded as a result of this planning document, EDUTEL will assign Mr. James Barewald as Project Manager. If Mr. Barewald is unavailable at the time of contract go-ahead, a person of equal experience and qualifications will be assigned. Mr. Barewald will devote full time to the engineering and management of the earth terminal procurement and installation during the first nine months of the project and during the follow-on years. Approximately 25% of this time will be spent in project management, overall guidance, and contract administration duties. The remainder of his time will be spent in performing and overseeing the engineering design procurement, installation and testing phases. Dr. Horley and Dr. Janky each will devote approximately 10% his time to management and liaison on this project. It is expected that contract labor will be used in the mechanical design and equipment testing phases.

The following pages include EDUTEL's Statement of Corporate Capability and resumes of key EDUTEL personnel.

EDUTEL
COMMUNICATIONS AND DEVELOPMENT, INC.
701 WELCH ROAD, SUITE 225, PALO ALTO, CALIFORNIA 94304 • 415/328-4972

STATEMENT OF CORPORATE CAPABILITY

PURPOSE

EDUTEL Communications and Development, Inc. was formed to meet the need for integrated interdisciplinary planning and analytical studies of telecommunications technology as applied to such public services as education, health and safety. Its work includes the detailed technical design of complete telecommunication systems, optimization analysis of alternative technologies, evaluation of hardware and software markets, critical component development, and the study of the role of telecommunications in national development, particularly in education and other social services.

Goals of our work are development of innovative options and systems plans for decision-makers, and development of reliable information and objective analysis on which decision-makers can base their investment planning. We believe that the unusually broad scope of our analysis, encompassing both the economics and technology of conventional telecommunications as well as the social service delivery systems' costs and benefits, provides the basis for useful insights in both areas of endeavor.

SUMMARY OF CAPABILITIES

- Economic Cost-Benefit and Market Analysis of Telecommunications and Broadcasting Services
- Integration of Satellite and Terrestrial Telecommunications
- Technical Analysis and Design of Communication Systems
- Consultants to the ITU, UNESCO, and World Bank
- Orbit-Spectrum Utilization Planning
- Regulatory Policy Analysis
- Practical Innovation for Institutional Change
- Satellite Earth Station Hardware Design and Prototype Development and Procurement

WASHINGTON ADDRESS: 600 E STREET, SUITE 100, WASHINGTON, D.C. 20004 • 202/638-4238

CURRENT ACTIVITIES

- Economic Cost-Benefit and Market Analysis of Telecommunications and Broadcasting Services

EDUTEL's contract with USAID's Technical Assistance Bureau calls for our staff to develop a systematized cost methodology that can be applied to educational technology projects in third world countries and to explore ways to advance the state-of-the-art in effectiveness and benefit evaluation. In this and in other endeavors, Dr. Horley has done pioneering work aimed at translating economic theory into practical investment decision-making procedures.

EDUTEL's work for the U.S. Department of Health, Education and Welfare involved examination of present and future demand for various health and educational telecommunications.

- Integration of Satellite and Terrestrial Telecommunications

EDUTEL is currently conducting a major design study for the Rural Electrification Authority of the most cost-effective system to provide communications among the rural areas of Alaska. The study includes examination of satellite technology to connect these rural areas to the world telephone network, and has both economic and technical components.

- Technical Analysis and Design of Communication Systems

EDUTEL is also playing a major design role in the National Public Radio satellite distribution network. Using concepts developed by EDUTEL, NPR is the first private satellite network with extensive interactive uplink capability. Using EDUTEL's design concepts, significant cost savings for the entire network are being realized. EDUTEL is responsible for much of the system design, especially the spectrum management and uplink system design.

EDUTEL has analyzed and designed baseline systems for providing video distribution for the Corporation for Public Broadcasting and for educational video and two-way voice/data systems for the Department of Health, Education and Welfare and for the Public Service Satellite Consortium. Economics provided the common point of evaluation for all those systems designs.

- Consultants to the ITU, UNESCO, and World Bank

EDUTEL has performed several economic feasibility and design studies for international clients under the auspices of the ITU, UNESCO, and the World Bank.

EDUTEL has provided technical and economic analysis support to the Philippines Ministry of Education on a preinvestment study of educational applications of communication techniques. The purpose of this study was to consider potential investment in communication technology as part of an overall educational development program funded by the World Bank. Detailed comparative costing of the major alternative educational technology proposals was part of the company's responsibility on this project.

EDUTEL has performed a system design for Afghanistan integrating broadcasting and communication capabilities for nationwide service, under sponsorship of the ITU.

- Orbit-Spectrum Utilization Planning, and
- Regulatory Policy Analysis

EDUTEL is providing technical, economic, and regulatory position papers for the Department of Health, Education, and Welfare, the Jet Propulsion Laboratories, and the Corporation for Public Broadcasting on satellite broadcasting and fixed service communications. Much of this work was done in preparation for the U.S. position at the World Administrative Radio Conferences of 1977 and 1979. Dr. Janky is a U.S. delegate to the C.C.I.R., and Dr. Horley has been a U.S. delegate to WARC-71.

EDUTEL has prepared materials for submission to the Federal Communication Commission on satellite communication regulatory policy issues.

- Practical Innovation for Institutional Change

Dr. Horley has been instrumental in introducing new concepts for using technology in health and education. As the Director of the Office of Telecommunications Policy, DHEW, he led the organizational efforts which resulted in the formation and funding of the Public Service Satellite Consortium. He is currently a member of the subcommittee on satellite communications of the Space Applications Board, National Academy of Sciences and participates regularly in NASA advisory committee meetings. Because of the previous experience of EDUTEL personnel, EDUTEL has extensive institutional contacts both nationally and internationally.

- Satellite Earth Station Hardware Design and Prototype Development and Procurement

EDUTEL has made notable contributions in the area of small aperture antenna sidelobe level control under a contract from Comsat General, and as a result of its involvement with the Iranian National Satellite Telephony and Television Network through subcontracts from Stanford University. EDUTEL has extensive experience with the design, fabrication, procurement management and installation of earth station terminal equipment.

EDUTEL's staff has considerable experience in the preparation of specifications and the evaluation of tenders for state-of-the-art satellite ground stations, having played major roles in the ATS-6, CTS, and Alaska earth station procurements.

PROFESSIONAL STAFF

Albert L. Horley, President
James M. Janky, Vice-President
Michael L. Davis, Vice-President
Steven P. Russell
James R. Barewald

Lin-shan Lee
Joanne J. Leslie
Ranjana Sharma
Hugh R. Paul

ALBERT L. HORLEY brings a broad background of skill in telecommunications including systems engineering program management, inter-agency coordination, and regulatory policy, having recently left the Department of Health, Education, and Welfare where he held the post of Director of Telecommunications Policy in the Office of the Secretary. He began his career in communications by managing the fabrication of an earth station at Kuala Lumpur, with the help of local students, as a Peace Corps volunteer in 1965. At DHEW he was instrumental in obtaining the necessary frequency allocation as well as the funding for the Health-Education Telecommunications experiment using the ATS-6 satellite. He has organized and led all of the international planning studies for EDUTEL, and has managed the studies performed for U.S.A.I.D. His main interests are in the areas of software utilization with satellite distribution systems, regulatory policy, and technology transfer to developing nations. He founded EDUTEL Communications and Development, Inc. in late 1975.

JAMES M. JANKY has a wide range of expertise in satellite communications with a special emphasis on the analysis, design, and fabrication of small earth stations and systems. He has had major responsibility in the planning and implementation of several large scale satellite projects, including the National Public Radio satellite distribution network, the Iranian national system for telephony and television, and the Health-Education Telecommunications demonstration using the ATS-6. He contributed to planning efforts for the Public Service Satellite Consortium and the Alaskan bushphone system. He was co-founder and president of Communications Planning Associates, now a subsidiary of EDUTEL. He has written extensively about small earth stations, and has contributed to World Administrative Radio Conference preparations through the C.C.I.R.

MICHAEL L. DAVIS has practical and administrative management experience in the planning, delivery and evaluation of social services. He was the executive assistant to the assistant secretary for Planning and Evaluation at DHEW, and was responsible for all grants and contracts from that office. At EDUTEL he is responsible for client liaison and sales. He also is director of the National Institute for Advanced Studies, and is currently providing social service support and research to the U.S. government.

STEVEN P. RUSSELL brings a strong background in satellite systems engineering teamed with a working background in economic analysis. His academic degrees are in engineering, economics, and physics. His experience includes extensive techno-economic research on desirable orbit-spectrum policy for the United States. He has prepared inputs for the C.C.I.R. and the FCC regarding WARC-77 and WARC-79. He has participated in the planning studies for National Public Radio, the Philippines, and Afghanistan. He was project leader for an Alaskan telephone equipment assessment and design. In other capacities he performed a pay-television market assessment and policy analysis, and he was responsible for carrying an information-theoretic concept from an academic conference through feasibility analysis, hardware design, and implementation in advanced LSI circuitry.

JAMES R. BAREWALD has extensive experience in satellite communication equipment design and manufacturing. He has a background in microwave engineering, industrial engineering, business economics, and engineering management. He has performed numerous technical studies and system designs for the Philippines, National Public Radio, and the Corporation for Public Broadcasting. He managed a study on 12 GHz unattended earth stations for the Corporation for Public Broadcasting and has prepared a study on sidelobe suppression techniques.

LIN-SHAN LEE has experience as a technical analyst in antennas and propagation. At Stanford University he contributed extensively to the study of propagation effects and improvements in sidelobe levels. He is knowledgable in satellite communication systems analysis and design.

JOANNE LESLIE combines training and background in the study of the economics of using mass media for formal and non-formal education, especially in researching the effects of education on nutritional status and the use of mass media for nutrition education. She has also been responsible for curriculum design of radio-based education in collaboration with the government of Brazil, and assisted in research on the use of computer-assisted instruction for the hearing handicapped.

RANJANA SHARMA has detailed experience in telephone switch design using computerized common control and time-division switching techniques. She also has experience in interfacing satellite equipment to terrestrial telephone equipment and in the optimization of communication network topology.

HUGH R. PAUL has a great deal of experience in assessing, designing, procuring, and installing telecommunications systems in developing countries. He has managed his own business in the UHF mobile radio field and has hands-on experience in hardware design and installation. He has extensive experience in the Middle East and Africa.

ALBERT L. HORLEY
President

FIELDS OF RESPONSIBILITY AT EDUTEL

Responsible for overall corporate management, marketing, and long-range planning. Responsible for all economic cost-benefit evaluation, institutional interactions and innovations, and policy guidance in technical areas.

WORK ASSIGNMENTS AT EDUTEL

In addition to overall corporate management and development, is responsible for project management of the USAID TAB/EHR contract on cost-effectiveness studies in educational technology. Managed the Philippine pre-investment study of telecommunications systems for use in education from conception to completion. Provided innovative concepts and policy guidance to NASA as a member of the Administrator's Advisory Board. Provided policy guidance on educational technology utilization to National Iranian Radio and Television. Provided policy analysis for the Department of Health, Education and Welfare and the Public Service Satellite Consortium on telecommunications systems development for social benefit and private sector profit.

EDUCATION

Carnegie Institute of Technology	BS in EE and Ed. Pshchology
Harvard University	MS in Applied Physics
Massachusetts Institute of Technology	Special Studies in Statistical Detection Theory and Radar Systems Analysis
Stanford University	PhD in Communications Systems Planning

Dissertation title: "An Investment Decision Analysis of Broadband Communications for Brazil"

PREVIOUS EXPERIENCE

Chairman and organizer of multi-agency policy committee that directs federal participation in the ATS-F broadcasting satellite experiments; membership includes the Department of Health, Education, and Welfare, The National Aeronautics and Space Administration, the Corporation for Public Broadcasting, and the Veterans Administration. In addition, had the responsibility of coordinating participation of non-federal experimenters, such as Federation of Rocky Mountain States, Appalachian Regional Commission, and the State of Alaska.

Coordinated U.S. educators efforts to gain international recognition of broadcasting satellite frequency allocations. Efforts were successfully concluded as a member of U.S. delegation to 1971 World Administrative Radio Conference when international agreement on satellite frequency allocations was achieved in the form of a treaty subsequently ratified by the U.S. Senate.

As the Department of Health, Education, and Welfare Secretary's representative on the Intragovernmental Radio Advisory Committee, developed and coordinated department-wide policy positions on telecommunications issues.

Chairman of UNESCO panel dealing with telecommunications as an element of comprehensive development planning. Conducted one week workshop in Paris with participants from more than a dozen countries.

Initialed and directed operations of the United Nations Center for Research and Training in Satellite Communications, Ahmedabad, India. Responsible for the preparation of all syllabus material, organization of the training courses and the direction of the Center's research activities. Over 40 trainees from 10 countries participated during his one-year assignment.

Co-authored 1966 UNESCO study on the possible educational uses of satellites in developing countries.

Performed economic and technical analysis for the White House of the Ford Foundation proposals for a satellite television service to provide revenue for public broadcasting.

Testified at the deliberations of the Carnegie Commission on Educational Television.

Performed benefit cost analysis of proposed Brazilian telecommunications development plan.

Prepared report and ran briefings for Secretary, DHEW, Administrator, NASA and various White House staff in connection with a Domestic Council study on technology applications.

WORK EXPERIENCE

Oct. 1975 - Present	EDUTEL Communications and Development, Inc. PRESIDENT
Oct. 1975 - Aug. 1976	Communication Satellite Planning Center, Stanford Univ. CONSULTANT
1970 - Oct. 1975	U.S. Department of Health, Education, and Welfare DIRECTOR OF TELECOMMUNICATIONS POLICY

WORK EXPERIENCE (continued)

1972	UNESCO EXPERT ADVISOR TO INDONESIA (short term)
1969	North American Rockwell Corp. MANAGEMENT CONSULTANT
1968	United Nations, International Telecommunications Union CHIEF TRAINING EXPERT IN SATELLITE COMMUNICATIONS
1966-67	Executive Office of the President, Office of Telecommunications Management CONSULTANT TO THE DIRECTOR
1965-70	Hughes Aircraft Co. - Space Systems Division MEMBER OF THE TECHNICAL STAFF - DOCTORAL FELLOW (on leave to UN and U.S. government after 1966)
1962-64	U.S. Peace Corps VOLUNTEER IN MALAYSIA
1960-61	RAND Corp. CONSULTANT
1958-59	Raytheon Corp. ENGINEER - RAYTHEON FELLOW AT HARVARD

JAMES M. JANKY
Vice-President

FIELDS OF RESPONSIBILITY AT EDUTEL

General corporate management and director of engineering; responsible for satellite communication systems research, analysis, design, and planning, with emphasis on applications for health and education, technology development and assessment of economic impact. Responsible for program management and finance.

WORK ASSIGNMENTS AT EDUTEL

Project Leader for HEW- and Jet Propulsion Laboratory-sponsored projects to prepare technical inputs to U.S. Study Group 10/11 B on Broadcasting Satellites for World Administrative Radio Conferences in 1977 and 1979; Project Leader for National Public Radio system design and procurement assistance project; performed system design for a radio distribution network for the Philippine government in Manila; consultant to Corp. for Public Broadcasting on satellite systems. Project Leader on Comsat General contract for development of low-sidelobe antenna.

EDUCATION

University of Detroit	BEE, Summa Cum Laude, June 1965
Stanford University	MSEE, January 1967
Stanford University	PhD, April 1971

OTHER WORK EXPERIENCE

December 1975 to Present: Cofounder and Principal Associate of Communications Planning Associates, a corporation specializing in technical, economic and developmental planning of satellite communication systems, now a wholly owned subsidiary of EDUTEL Communications and Development, Inc.

Prepared, presented and defended the U.S. position on antenna performance for community and individual reception in the broadcast satellite service at the May 1976 CCIR meetings. Became international chairman on computer programs for use in planning at this same meeting.

Participated in system planning for the following programs:

- Iranian National Satellite System for Telephony and Television Service
- Alaskan "bushphone" telephony network
- Public Service Satellite Consortium

October 1972 - April 1975: As Assistant Director of the Federation of Rocky Mountain States engineering group, had major responsibility for hardware implementation of the Health Educational Technology Demonstration experiment with the ATS-6 spacecraft. This included management of design, procurement, installation and operation of the terminal equipment in the network, directed the work of 14 staff members and five consultants.

Partner and cofounder of TJ Associates, a consulting-manufacturing company specializing in antenna systems.

Secretary and member of the Board of Directors of the Alma Corporation, a digital integrated circuit testing company, now a subsidiary of Develco Corporation.

Dissertation:

Optimization in the Design of a Mass-Producible Microwave Receiver Suitable for Direct Reception from Satellites, under the direction of Prof. Bruce B. Lusignan, Stanford University.

Publications:

An Advanced System for Communication and Education in National Development, School of Engineering, Stanford University, June 1967, with 35 co-authors. Also presented at the NEREM conference in Boston, November 1967.

"Nomograms Simplify Phase-Lock Loop Analysis," Microwaves, Vol. 9, No. 3, March 1970, p.52.

"Low-Cost Receivers for Use in Instructional Broadcasting via Satellites," with R.B. Taggart, Jr. and B.B. Lusignan; presented at the IEEE International Conference on Communications, San Francisco, June 10, 1970.

"Production Design of a $100 Antenna-Receiver for Reception of Television from Satellites at 2.6 GHz," with R.B. Taggart, Jr., and B.B. Lusignan; presented at the IAF International Astronautical Congress in Constance, Germany, October 7, 1970.

"Low-Cost ETV Satellite Receivers," with B.B. Lusignan and R.B. Taggart, Jr.; AIAA Progress in Astronautics and Aeronautics, Vol. 25, 1970.

Invited Technical Specialist at the First Interdisciplinary Seminar on Technology Applicable to Teleducation, Lima Peru, April 18-30, 1971.

Optimization in the Design of a 12 GHz Low-Cost Ground Receiving System for Broadcast Satellites, with four co-authors, Center for Radar Astronomy, Stanford University, June 1972.

"The ATS-6 Health-Educational Technology Communications Network," with J.G. Potter, presented at the International Conference on Communications, Seattle, June 1973.

"The Voice-Data Communications System in the Health, Educational Technology Experiment," with D.R. Laurence and L.W.Ritchey; presented at the International Conference on Communications, San Francisco, June 18, 1975.

Communication Satellite and Earth Station Hardware Review, Vol. II of Technical Report No. 2, Communication Satellite Planning Center, prepared under contract to National Iranian Radio and Television, August 1975.

A Baseline System Configuration for Video Distribution and Telephony, ed. and contributor, with several co-authors, Vol. III of Technical Report No. 2, Communication Satellite Planning Center, prepared under contract to National Iranian Radio and Television, August 1975.

"System Alternatives for the Public Service Satellite Consortium," with J.G. Potter and B.B. Lusignan; National Telemetry Conference, Washington, D.C., October 1975.

"Remote Terminals in the HET Network," IEEE Transactions on Aerospace and Electronic Systems, Special Issue on the Applications Technology Satellite-6, November 1975.

"Education Via Satellite: How it was Done by the Federation of Rocky Mountain States," with Dennis R. Laurence; Communications Society, Vol. 13, No. 6, Nov. 1975, pp. 13-17.

"The Development of the Public Service Satellite Consortium: A History and Analysis of Technical Alternatives," with J.G. Potter and B.B. Lusignan; National Telecommunications Conference, New Orleans, December 1, 1975.

"The Co-Op in the Sky," with B.B. Lusignan, J.G. Potter, IEEE Spectrum, Feb. 1976.

Planning for a Satellite Distribution Network for National Public Radio: Technical, Economic and Implementation Considerations, with B.B. Lusignan, M.J. Sites, and T. Odden, Technical Report No. 8, Communication Satellite Planning Center, April 1976.

Propagation Effects, New Corrective Measures, and Antenna Sidelobe Performance, with Lin-shan Lee, Technical Report No. 9, Communication Satellite Planning Center, July 1976.

"New Sidelobe Envelopes for Small Aperture Earth Stations," with B.B. Lusignan, Lin-shan Lee, E.C. Ha, and E.F. Reinhart. IEEE Transactions on Broadcasting, Vol. BC-22, No. 2, June 1976.

"Technical and Interference Aspects of Satellite Networks with Small-Aperture Earth Stations," with M. J. Sites and B.B. Lusignan, International Communications Conference, June 1976, Philadelphia, PA.

"Sidelobe Levels Attainable in Small-Aperture Antennas," with Philip A. Rubin, and Steven P. Russell; IEEE Transactions on Broadcasting, Vol. BC-23, No. 1, March 1977.

"Interference Control in Broadcast Satellite Applications: Antenna Sidelobe Patterns and Transponder Transfer Gain," with James R. Barewald; EASCON-77, September 26-28, 1977, Washington, D.C.

JAMES R. BAREWALD
Systems Engineer
Licensed Professional Engineer

FIELDS OF RESPONSIBILITY AT EDUTEL

Communication systems engineering and cost analysis. Communication satellite system design and analysis. Equipment specification for video, FM, and digital communications systems.

WORK ASSIGNMENTS AT EDUTEL

Analysis and report on antenna sidelobe suppression techniques. Study on satellite antenna beamshaping techniques. Analysis and system design for Philippines government educational satellite system using FM-SCPC. Analysis and system design on video receive-only earth terminals for PBS at 2.5 GHz and 12 GHz. Design studies, frequency coordination support, and cost analysis for National Public Radio Satellite Interconnection Project.

EDUCATION

Iowa State University	BS in Chemistry, 1952
Univeristy of Colorado	BS in Electrical Engineering, 1960
Stanford University	MS in Electrical Engineering-Administration, 1969

OTHER WORK EXPERIENCE

1976	Private Consultant to microwave industry.
1974-76	Aydin Energy Systems - Manager of engineering group in satellite earth station medium power transmitters and microwave systems.
1972-74	Varian Associates - Manager of department with responsibility for design and production of satellite earth station TWT amplifiers.
1965-72	Applied Technology Division of Itek - Design studies and flight test engineering on ECM equipment. Development of ECM equipment and radar simulators. Program Manager on large scale project for design and production of radar jamming equipment.
1960-65	Lockheed Missiles and Space Co. - Studies and analysis of antennas and propagation in ground and space environments. Radar cross-section studies and dielectric constant measurements. Signal analysis on telemetry links.
1965-77	Board of Trustees, Mountain View School District, Mtn.View, CA

HUGH R. PAUL
Consultant

FIELDS OF RESPONSIBILITY AT EDUTEL

Radio and television system planning and needs assessment. VHF/UHF system specification, procurement, and installation management.

WORK ASSIGNMENTS AT EDUTEL

Consultant on VHF/UHF communication needs assessment in developing countries with emphasis on Africa and the Middle East.

EDUCATION

Valparaiso Technical Institute	1954-55
Western Michigan University	1957-59
University of Southern California	BSc equivalent Calif. Teacher's Certificate, 1975

OTHER WORK EXPERIENCE

Presently Director of Engineering KUSC-FM at the University of Southern California. Responsible for all phases of design, implementation and administration. Consultant to many broadcasting facilities in greater Los Angeles area.

Adjunct Professor in Electrical Engineering at USC and at Saddleback Community College.

Was Technical Director for Delta Associates Ltd. of Great Britain. Was in charge of prime and sub contracts on such projects as the TV network and Military Police communications system for the government of Greece; survey for transmitters and antenna system of Falkala Island VHF TV system in Kuwait; expansion of broadcast and communications facilities in Sudan; and design of communication system for military police in Lebanon.

Was Founder and President of Induscomm Electronics, Inc., consulting engineers and marketing agents in the fields of broadcasting and communications. Designed systems and held maintenance contracts for numerous governmental agencies and private industry.

Was Field Engineering Representative on U.S. Navy A5A program specializing in radar, airborne TV and communications for North American Aviation, Autonetics division. Also control systems on Minuteman missle program for U.S. Air Force.